ANNUAL REGISTER

OF THE

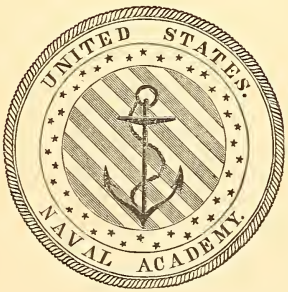
UNITED STATES NAVAL ACADEMY,

AT

ANNAPOLIS, MD.

TWENTY-SIXTH ACADEMIC YEAR,

1875-76.



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1875.

OFFICERS DIRECTORY

U. S. Naval Academy,

January 1, 1876.

Rear-Admiral C. R. P. Rodgers, Superintendent.

Commander	Edward Terry,	No. 1, Officers Quarters.
"	J. A. Howell,	do 6, do
"	H. L. Howison,	do 4, do
"	N. H. Farquhar,	do 3, do
"	James O'Kane,	do 9, do
"	W. S. Schley,	do 5, do
"	W. T. Sampson,	do 11, do
Lieut. Commander	A. S. Barker,	do 27, do
"	S. W. Terry,	do 25, do
"	M. Miller,	U. S. Ship "Santee."
"	P. F. Harrington,	No. 26, Officers Quarters.
"	C. M. Chester,	do 18, do
"	C. V. Gridley,	do 14, do
"	A. G. Caldwell,	do 19, do
"	C. W. Kennedy,	do 17, do
"	B. H. McCalla,	do 20, do
"	S. H. Baker,	do 12, do
"	T. F. Jewell,	do 14, do
"	J. Schouler,	do 19, do
Lieutenant	S. Hubbard,	No. 7, Old quarters Cadets.
"	J. H Dayton,	do 7, "
"	Asa Walker,	do 14, Officers Quarters.
"	C. S. Sperry,	do 9, Old quarters Cadets.
"	H. Knox,	do 13, Officers Quarters.
"	S. A. Simons,	do 12, "
"	C. Belknap,	do 88, Prince George's st., Annapolis
"	E. D. F. Heald,	do 12, Officers Quarters.
"	E. P. Wood,	do 98, King George st., Annapolis.
"	C. C. Cornwell,	do 27, Officers Quarters.
"	R. P. Rodgers,	do 14, do
"	T. B. M. Mason,	do , P. Geo. & Tab. sts., Annapolis
"	A. V. Wadhams,	do 6, State House Circle, Annapolis.
"	C. P. Perkins,	do 9, Old quarters Cadets.
"	W. P. Potter,	do 30, Hanover st., Annapolis.
"	J. B. Briggs,	do 40, Corn Hill st., Annapolis.
Ensign	W. H. H. Southerland,	do 7, Old quarters Cadets.
"	J M. Roper,	do 7, do
"	T. B. Howard,	do 7, do
"	A. A. Michelson,	do 7, do
Medical Inspector	A. L. Gihon,	do 15, Officers Quarters.
Surgeon	G. A. Bright,	do 7, Old Quarters Cadets.

A. P. A. Surgeon J. J. Sowerby, Sick quarters, Naval Academy.
A. A. Surgeon T. O. Walton, No. 11, Maryland avenue, Annapolis.
Paymaster A. S. Kenny, do 2, Officers Quarters.
" W. Goldsborough, (U. S. S. "Santee," No. 7, Church Circle, Annapolis
" S. T. Browne, (Storekeeper,) No. 21, Officers Quarters.
Chief Engineer C. H. Baker, do 7, "
P. A. Engineer T. W. Rae, do 12, "
" J. L. D. Borthwick, do 13, "
" W. L. Nicoll, do 8, Old quarters Cadets.
" G. E. Tower, do 13, Officers Quarters.
" D. Jones, do 13, "
Asst. Engr. C. W. Rae, do 19, "
Chap'ain J R. Matthews, do 16, "
Professor W. W. Hendrickson, do 10, "
" J. M. Rice, do 9, Old quarters Cadets.
" R. S. Smith, do 8, Officers Quarters.
" J. R. Soley, do 23, "
" L. F. Prud'homme, do 9, Duke Gloucester st., Anna.
" N. M. Terry, do 9, Old quarters Cadets.
" C. E. Munroe, do 7, do
Asst. Prof. T. Karney, do , Maryland avenue, Annapol
" W. W. Fay, do 102, P. George's st., Annapolis
" A. V. S. Courcelle, do 101, Church st., Annapolis.
" E. Dovilliers, do 19, Cornhill st., Annapolis.
" J. Leroux, do 6, State House Circle, Annapol
" H. Dalmon, do 8, Old quarters Cadets.
" P. Montaldo, do 7, do
" Marshal Oliver, do , Doc. & Cath. sts., Annapol
" C. F. Blauvelt, do 9, Old quarters Cadets.
" F. Snow, do 9, do
" E. Lord, do 8, do
Secretary R. M. Chase, do 28, Officers Quarters.
Commissary R. Swann, do 22, do
Asst. Librarian J. J. Graff, do 8, West st., Annapolis.
1st Clerk to Sup't J. G. Glynn, do 61, P. George's st. Annapolis.
2d " Sam'l Jickling, do 23, Green st., Annapolis.
Clk. to Comd't Cadets C. M. McLeod, do , Cathedral st., Annapolis.
" E. Worthington, do , State House Circle, Annapolis.

Marine Garrison.

Cap'ain McLane Tilton, Comd'g, No. 90, Prince George's st., Annapolis.
1st Lieut. J. M. T. Young, Maryland Hotel, Annapolis
" D. Pratt Mannix, do
" Sam'l K. Allen No. 30, Hanover st., Annapolis.
Boatswain A. Milne, U. S. S. "Dale," N. A.
Gunner Robert Sommers, U. S. S. "Dale," N. A.
Sword Master A. J. Corbesier, No. 27, Maryland avenue, Annapolis.
Asst. Sword Master J. B. Retz, do 32, Tabernacle st., Annapolis.
" " George Heintz, do 35, Hanover st., Annapolis.
Boxing Master Matthew Strom, do 96, King George st., Annapolis.

Naval Hospital near Annapolis.

Medical Inspector A. C. Gorgas, in charge.

CONTENTS.

THE

UNITED STATES NAVAL ACADEMY.

The United States Naval Academy was founded in 1845, by George Bancroft, Secretary of the Navy, in the administration of President James K. Polk. It was formally opened October 10, of that year, under the name of the Naval School, with Commander Franklin Buchanan as Superintendent. It was placed at Annapolis, Md., on the land occupied by Fort Severn, which was given up by the War Department for the purpose. The School at its establishment numbered 56 Midshipmen, of whom 36, of the date of 1840, were preparing for examination; 13, of the date of 1841, were to remain at their studies until ordered to sea; and 7, just appointed, were to take the regular course, which was fixed as one year at the School, three years at sea, and a fifth and final year at the School, before promotion. Later, the course was altered to seven years, of which the first two and last two were at the School, and the intervening years at sea.

In October, 1849, a board of officers was appointed to re-organize the School. A new system was devised, and carried into operation, July 1, 1850. By this, the course of instruction was made more extensive, and arranged to cover four consecutive years; the corps of Professors was increased, and a Sloop-of-war, the Preble, was attached to the School as a practice-ship. The new school was called the Naval Academy, and was placed under the supervision of the Chief of the Bureau of Ordnance and Hydrography. A board of visitors was appointed to examine into the state of the Academy annually, and to make a report upon its condition to the Secretary of the Navy. The first class of Acting Midshipmen under the four years' course entered in October, 1851, and was graduated in June, 1854.

In May, 1861, on the outbreak of the war, the Academy was removed to Newport, R. I. The three upper classes were detached and ordered to sea, and the remaining Acting Midshipmen were quartered in the Atlantic House and on board the Frigate Constitution. In September, 1865, the Academy was moved back to Annapolis, where it has since remained.

When the Bureau of Navigation was established, July 5, 1862, the Academy was placed under its supervision; March 1, 1867, it was placed under the direct care and supervision of the Navy Department, the administrative routine and financial management being still conducted through the Bureau. This system was followed till March 11, 1869, when all connection with the Bureau ceased.

The term of the academic course was changed by law, March 3, 1873, from four to six years. The change took effect with the class which entered in the following summer.

In 1866, a class of Acting Third Assistant Engineers was ordered to the Academy for instruction. The course embraced the subjects of steam-engineering, iron-manufacture, chemistry, and mechanics, and practical exercises with the steam-engine and in the machine-shop. This class was graduated in June, 1868, together with two Cadet-Engineers who had entered the Academy in 1867. After an interval of four years, in October, 1871, a new class of Cadet-Engineers was admitted. This class followed a two years' course, somewhat more extended than that of the class of 1868, and was graduated in 1873. In 1872 and 1873, new classes were admitted, the first of which left the Academy in 1874, and the second last summer. By an act of Congress, approved February 24, 1874, the course of instruction for Cadet-Engineers was made four years, instead of two; and the new provision was first applied to the class entering the Academy in the year 1874.

There are now three classes of Cadet-Engineers at the Academy: the first, composed of Cadets turned back from the class last graduated, on account of deficiency in scholarship, whose course ends in 1876; the third, which entered in 1874, under the new law; and the fourth, admitted in September, 1875.

BOARD OF VISITORS, JUNE, 1875.

Commodore FOXHALL A. PARKER, U. S. N., *President.*
Brevet Major-General E. O. C. ORD, U. S. A., *Vice-President.*
Captain GEORGE E. BELKNAP, U. S. N.
Pay-Director ROBERT PETTIT, U. S. N.
Chief-Engineer ALEXANDER HENDERSON, U. S. N.
Major W. E. POTTER, of New Jersey.
Rev. O. H. TIFFANY, D. D., of Illinois.
Professor J. G. JAMES, of Texas.
Professor E. S. CARR, of California.
Professor A. M. GOW, of Indiana.

CALENDAR.

1875-76.

1875.
Sept. 20.—Beginning of first term ..... Monday.
1876.
Jan. 24-29.—Semi-annual examination ..... Monday-Saturday.
Jan. 29.—End of first term ..... Saturday.
Jan. 31.—Beginning of second term ..... Monday.
June 10-20.—Annual examination ..... Saturday-Tuesday.
June 20.—End of academic year 1875-76 ..... Tuesday.
June 21.—Examination of candidates for admission as Cadet-Midshipmen ..... Wednesday.
Sept. 5.—Examination of candidates for admission as Cadet-Engineers ..... Tuesday.
Sept. 12.—Examination of candidates for admission as Cadet-Midshipmen ..... Tuesday.
Sept. 20.—Beginning of first term 1876-77 ..... Wednesday.

The academic months of 1875-76 end on the following days:

October	Oct. 23	February	Mar. 4
November	Nov. 20	March	April 1
December	Dec. 18	April	April 29
January	Jan. 22	May	June 3

CALENDAR FOR 1875-76.

SEPTEMBER.

Sun.	M.	T.	W.	T.	F.	Sat.
....	....	....	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	....	....

OCTOBER.

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10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31	....	....	....	....	....	....

NOVEMBER.

....	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	....	....	....	....

DECEMBER.

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19	20	21	22	23	24	25
26	27	28	29	30	31	....

JANUARY.

....	....	....	....	....	....	1
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9	10	11	12	13	14	15
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30	31	....	....	....	....	....

FEBRUARY.

....	....	1	2	3	4	5
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13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	....	....	....	....

MARCH.

Sun.	M.	T.	W.	T.	F.	Sat.
....	....	....	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	....

APRIL.

....	....	....	....	....	....	1
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9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	....	....	....	....	....	....

MAY.

....	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31	....	....	....

JUNE.

....	....	....	....	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	....

JULY.

....	....	....	....	....	....	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	....	....	....	....	....

AUGUST.

....	....	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	....	....

OFFICERS

OF THE

UNITED STATES NAVAL ACADEMY.

REAR-ADMIRAL
CHRISTOPHER RAYMOND PERRY RODGERS,
SUPERINTENDENT.

COMMANDER NORMAN VON HELDREICH FARQUHAR,
Senior Aid to the Superintendent.

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SEAMANSHIP, NAVAL TACTICS, AND NAVAL CONSTRUCTION.

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LIEUTENANT-COMMANDER COLBY MITCHELL CHESTER,
LIEUTENANT-COMMANDER CHARLES VERNON GRIDLEY,
LIEUTENANT EUGENE DE FOREST HEALD,
Instructors in Seamanship, Naval Tactics, and Naval Construction.

MATTHEW STROHM,
Instructor in Boxing, Swimming, and Gymnastics.

ORDNANCE AND GUNNERY.

COMMANDER JAMES O'KANE,
Head of Department.

LIEUTENANT-COMMANDER MERRILL MILLER,
In charge of practice-ships.

LIEUTENANT-COMMANDER ALBERT GALLATIN CALDWELL,
LIEUTENANT-COMMANDER BOWMAN HENDRY MCCALLA,
LIEUTENANT SIDNEY AUGUSTUS SIMONS,
LIEUTENANT ALBION VARETTE WADHAMS,
Instructors in Naval Gunnery and Infantry Tactics.

ANTOINE J. CORBESIER,
Sword-Master.

JEAN B. RETZ,
GEORGE HEINIZ,
Assistant Sword-Masters.

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PROFESSOR WILLIAM WOODBURY HENDRICKSON,
Head of Department.

LIEUTENANT-COMMANDER CHARLES WILLIAM KENNEDY,
LIEUTENANT-COMMANDER SAMUEL HOUSTON BAKER,
LIEUTENANT SOCRATES HUBBARD,
LIEUTENANT JAMES HENRY DAYTON,
LIEUTENANT ASA WALKER,
LIEUTENANT CHARLES STILLMAN SPERRY,
ENSIGN WILLIAM HENRY HUDSON SOUTHERLAND,
ENSIGN JESSE MIMS ROPER,
ENSIGN THOMAS BENTON HOWARD,
Instructors in Mathematics.

STEAM-ENGINERY.

CHIEF ENGINEER CHARLES HENRY BAKER,
Head of Department.

PASSED ASSISTANT ENGINEER THOMAS WHITESIDE RAE, C. E.,
PASSED ASSISTANT ENGINEER JOHN LIVINGSTON DINWIDDIE BORTHWICK, A. M.,
PASSED ASSISTANT ENGINEER WILLIAM LEONARD NICOLL,
PASSED ASSISTANT ENGINEER GEORGE EDWARD TOWER,
PASSED ASSISTANT ENGINEER DAVID JONES,
ASSISTANT ENGINEER CHARLES WHITESIDE RAE, C. E.,
Instructors in Steam-Enginery.

ASTRONOMY, NAVIGATION, AND SURVEYING.

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LIEUTENANT RAYMOND PERRY RODGERS,
LIEUTENANT CHARLES PLUMMER PERKINS.
Instructors in Astronomy, Navigation, and Surveying.

PHYSICS AND CHEMISTRY.

COMMANDER WILLIAM THOMAS SAMPSON,
Head of Department.

LIEUTENANT-COMMANDER ALBERT SMITH BARKER,
LIEUTENANT-COMMANDER THEODORE FRELINGHUYSEN JEWELL,
PROFESSOR NATHANIEL MATSON TERRY, A. M., PH. D.,
PROFESSOR CHARLES EDWARD MUNROE, S. B.,
Instructors in Physics and Chemistry.

PROFESSOR JOHN MINOT RICE, S. B.,
LIEUTENANT HARRY KNOX,
LIEUTENANT CHARLES CARPENTER CORNWELL,
Instructors in Applied Mathematics and Mechanics.

ENGLISH STUDIES, HISTORY, AND LAW.

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LIEUTENANT EDWARD PARKER WOOD,
LIEUTENANT WILLIAM PARKER POTTER,
LIEUTENANT JOHN BRADFORD BRIGGS,
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ASSISTANT PROFESSOR FREEMAN SNOW, A. B.,
ASSISTANT PROFESSOR ELIOT LORD, A. B.,
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MODERN LANGUAGES.

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Head of Department.

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ASSISTANT PROFESSOR PEDRO MONTALDO,
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PROFESSOR LUCIEN FRANKLIN PRUD'HOMME,
ASSISTANT PROFESSOR ALPHONSE V. S. COURCELLE,
ASSISTANT PROFESSOR EUGENE DOVILLIERS,
ASSISTANT PROFESSOR JULES LEROUX,
ASSISTANT PROFESSOR HIPPOLYTE DALMON,
Instructors in French.

DRAWING.

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Head of Department.

ASSISTANT PROFESSOR MARSHAL OLIVER,
ASSISTANT PROFESSOR CHARLES FRANCIS BEAUVELT, N. A.,
Instructors in Drawing.

OFFICERS NOT ATTACHED TO THE ACADEMIC STAFF.

MEDICAL INSPECTOR ALBERT LEARY GIHON, A. M., M. D.
SURGEON GEORGE ADAMS BRIGHT, M. D.
ACTING PASSED ASSISTANT SURGEON JOSEPH JOHN SOWERBY, M. D.
ACTING ASSISTANT SURGEON THOMAS OLIVER WALTON, M. D.
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PAYMASTER SAMUEL TRACEY BROWNE, *Storekeeper.*
CHAPLAIN JOHN RUTHERFORD MATTHEWS, A. M.
ASSISTANT PROFESSOR THOMAS KARNEY, A. M., *Librarian.*
JAMES JOHNSON GRAFF, *Assistant Librarian.*
RICHARD SWANN, *Commissary.*
RICHARD MOALE CHASE, *Secretary.*

JAMES G. GLYNN, *First Clerk.*
SAMUEL JICKLING, *Second Clerk.*
CHARLES MARION MCLEOD, *Clerk to Commandant of Cadets.*
EUGENE WORTHINGTON, *Third Clerk to Superintendent.*

MARINE GARRISON.

CAPTAIN MCLANE TILTON, *Commanding.*
FIRST LIEUTENANT HENRY CLAY COCHRANE.
FIRST LIEUTENANT JAMES M. T. YOUNG.
FIRST LIEUTENANT DANIEL PRATT MANNIX.
FIRST LIEUTENANT SAMUEL KUYPERS ALLEN.

MATES.

C. J. MURPHY, WILLIAM G. SMITH, L. M. MELCHER, T. W. BONSALL — *Attached to the United States Gunnery-ship Santee and to the Sloop-of-war Dale.*
ROBERT SILVER — *Attached to United States Steamer Lehigh (iron-clad).*
BENJAMIN G. PERRY, JOSEPH RODGERS — *Attached to the United States Steamer Phlox (steam-tender).*

ACADEMIC BOARD.

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COMMANDER EDWARD TERRY, U. S. N.
COMMANDER J. A. HOWELL, U. S. N.
COMMANDER H. L. HOWISON, U. S. N.
COMMANDER JAMES O'KANE, U. S. N.
COMMANDER W. S. SCHLEY, U. S. N.
COMMANDER W. T. SAMPSON, U. S. N.
CHIEF ENGINEER C. H. BAKER, U. S. N.
PROFESSOR W. W. HENDRICKSON, U. S. N.
PROFESSOR R. S. SMITH, A. M.
PROFESSOR J. R. SOLEY, A. B.

CADET-OFFICERS.

CADET LIEUTENANT-COMMANDER.

GEORGE C. FOULK.

CADET-LIEUTENANTS.

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STEPHEN JENKINS.
LOVELL K. REYNOLDS.
HENRY C. GEARING.

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S. J. BROWN.
W. H. ALLEN.
C. J. BOUSH.
T. G. WINCH.

ADJUTANT.

T. M. POTTS.

CADET-ENSIGNS.

W. J. CHAMBERS.
J. H. SEARS.
C. C. ROGERS.
R. T. MULLIGAN.

CADET PETTY-OFFICERS.

First Captains of Gun's Crews.

R. C. Ray.
A. E. Jardine.
E. M. Katz.
J. T. Newton.
Dewitt Coffman.
Richard Henderson.
Benjamin Tappan.
E. E. Wise.
W. D. Rose.
C. A. Gove.
H. T. Mayo.
W. S. Hogg.
L. W. Piepmeyer.
William Braunersreuther.
B. T. Walling.
A. E. Culver.

Second Captains of Gun's Crews.

W. F. Fullam.
C. F. Pond.
A. G. Winterhalter.
A. W. Rollins.
D. R. Case.
S. B. Mallory.
W. V. Bronaugh.
O. G. Dodge.
Alfred Jeffries.
Walter McLean.
W. G. David.
J. C. Gilmore.
F. H. Sherman.
J. M. Orchard.
H. M. Witzel.
J. McL. Proudfit.

MIDSHIPMEN.

Graduating class of 1875—32 members.

Order of general merit.	Name.	State.	Date of admission.	Age at date of admission.		Order of merit in—										Number of demerits.	Sea-service in practice-ships.	
				Years.	Months.	Seamanship.	Practical exercises.	Naval architecture.	Gunnery.	Fencing.	Steam-engineery.	Navigation.	Heat.	Light.	Law.	Spanish.		Months.	Days.
*1	**Hodgson, Albon Chase**	Georgia	June 5, 1871	17	10	6	6	1	2	15	1	1	1	1	1	1	55	6	26
*2	**Amsden, Charles Heath**	Ohio	Sept. 20, 1871	17	11	9	1	7	6	1	4	11	15	12	20	4	62	6	26
*3	**Winslow, Cameron McRae**	At large	Sept. 27, 1870	16	1	5	5	2	3	3	14	5	11	8	9	13	26	6	26
*4	**Helm, James Meredith**	Tennessee	Sept. 29, 1871	15	9	1	7	5	11	2	2	2	3	6	5	10	95	6	26
*5	**Cutler, William Gifford**	At large	Sept. 20, 1871	16	11	8	11	8	11	22	20	6	9	19	11	2	60	6	26
6	Corbin, Clarence Arthur	Michigan	Sept. 26, 1870	17	2	4	8	3	7	8	12	14	19	9	13	11	117	10	4
7	Carter, Fydelio Sharps	Illinois	Sept. 29, 1870	17	4	2	2	27	4	6	14	20	31	15	3	21	31	10	4
8	Coffin, Frederick Wesley	Massachusetts	June 15, 1870	17	9	3	15	11	10	17	18	16	12	9	2	6	125	6	26
9	Hosley, Harry Hibbard	New Hampshire	Sept. 22, 1871	15	10	11	20	6	19	29	5	3	2	21	25	3	120	6	26
10	Laird, Charles	Ohio	Sept. 28, 1870	16	7	14	10	18	8	24	9	16	17	7	14	24	86	6	26
11	Hughes, Walter Scott	Iowa	Sept. 24, 1870	17	11	29	26	15	19	26	7	11	13	5	20	16	25	6	26
12	Usher, Nathaniel Reilley	Indiana	Sept. 21, 1871	16	5	14	15	25	16	12	8	15	25	22	20	16	107	6	26
13	Hodges, Harry Marsh	Illinois	Sept. 29, 1870	15	3	26	19	13	19	30	16	9	22	13	24	26	22	6	26
14	Fletcher, Frank Friday	Iowa	Sept. 22, 1870	14	10	24	20	17	22	11	29	11	19	4	19	19	73	10	4
15	Daniels, David	Massachusetts	June 5, 1871	15	4	7	12	3	24	19	11	9	7	24	7	5	20	6	26
16	Sharp, Alexander, jr	District of Columbia	June 20, 1870	14	7	28	4	10	13	10	3	8	6	11	12	27	32	10	4
17	Wood, Moses Lindley	Missouri	Sept. 21, 1871	17	1	24	26	21	1	9	5	22	4	14	18	9	72	6	26
18	Townley, Richard Henry	Nebraska	June 20, 1870	17	4	23	25	12	9	13	13	25	24	18	23	14	61	6	26
19	Bostick, Edward Dorsey	South Carolina	Sept. 24, 1870	17	1	21	12	13	13	18	25	24	15	16	4	25	80	10	4
20	Worcester, George Henry	New York	Sept. 26, 1871	14	3	31	26	19	5	26	9	4	5	3	27	16	91	6	26
21	Sherman, John Adams	New York	June 7, 1871	16	10	18	18	31	32	7	28	18	26	27	30	23	141	6	26

22	Beatty, Frank Edmund	Minnesota	Sept. 21, 1871	17	9	17	20	22	16	31	19	7	7	2	17	15	111	6	26
23	Doyle, Robert Morris	Tennessee	Sept. 21, 1870	16	4	12	31	16	28	23	22	21	10	16	8	30	85	10	4
24	Smith, James Thomas	North Carolina	June 5, 1871	16	3	26	26	23	13	24	31	26	23	28	10	7	17	6	26
25	McCartney, Charles Michael	Pennsylvania	Sept. 23, 1869	15	1	32	30	20	31	32	23	19	17	19	15	8	99	6	26
26	Howe, Alfred Leighton	Pennsylvania	Sept. 28, 1870	16	5	16	24	30	26	26	16	28	27	23	16	21	79	10	4
27	Hunt, Henry Jackson	At large	June 23, 1870	15	2	10	8	24	30	4	21	29	14	25	31	31	130	10	4
28	Collins, Frank Sheldon	At large	Sept. 25, 1871	17	2	30	32	9	18	13	26	27	27	29	6	28	84	6	26
29	Hunt, Ridgly	Louisiana	Sept. 20, 1870	16	7	18	2	32	27	16	30	30	19	25	32	28	127	10	4
30†	Vinton, Frederick Betts	New York	Sept. 20, 1871	16	9	21	23	26	25	20	24	30	32	30	26	11	123	6	26
31†	Caperton, William Banks	Tennessee	June 5, 1871	15	11	18	12	27	23	5	26	23	29	31	28	20	5	6	26
32†	Stoney, George	Alabama	Sept. 20, 1870	17	11	12	15	29	29	21	32	32	30	32	28	32	92	6	26

† Graduated September, 1875.

CADET-MIDSHIPMEN.

First class—42 members.

Order of annual merit.	Name.	State.	Date of admission.	Age at date of admission.		Order of merit in—												Number of demerits.	Sea-service in practice-ships.	
				Years.	Months.	Seamanship.	Naval tactics.	Ship-building.	Gunnery.	Infantry-tactics.	Fencing.	Astronomy.	Electricity and magnetism.	Applied mathematics.	English composition.	French.	Drawing.		Months.	Days.
6	Allen, William Herschell	Illinois	Sept. 26, 1872	15	10	24	4	8	6	1	27	3	4	10	19	15	28	41	6	11
11	Bonsh, Clifford Joseph	Virginia	June 5, 1872	17	9	6	15	4	27	8	25	23	19	14	30	19	11	62	6	11
42	Brannersrenther, William	Illinois	Sept. 23, 1871	17	7	27	46	11	40	32	10	45	36	33	41	34	33	138	6	11
1	**Brown, Stimpson Joseph**	New York	Sept. 16, 1872	17	11	11	18	2	1	3	6	2	2	2	11	2	7	117	6	11
34	Case, Daniel Rogers	At large	June 5, 1872	15	0	30	9	20	38	21	23	28	20	38	33	27	32	193	8	28
24	Chambers, Washington Irving	New York	June 5, 1871	15	2	23	11	39	44	30	4	41	39	25	15	17	6	92	11	20
31	Coffman, De Witt	Virginia	June 6, 1872	17	6	40	32	14	19	41	6	31	21	28	43	33	26	78	6	11
14	Culver, Abraham Ellis	New York	June 5, 1872	16	2	42	11	21	15	39	36	7	17	3	7	7	17	59	8	28
39	Fisher, Elstner Nelson	Pennsylvania	Sept. 24, 1872	17	11	37	45	15	32	38	11	33	13	33	17	42	21	193	6	11
2	**Foulk, George Clayton**	Pennsylvania	June 14, 1872	15	7	2	2	6	2	10	16	7	8	6	4	12	8	71	8	28
3	**Gearing, Henry Chalfant**	Pennsylvania	June 12, 1872	17	3	6	16	9	4	1	17	1	1	1	12	8	23	121	8	28
28	Gillmore, James Clarkson	Pennsylvania	Sept. 20, 1871	17	2	32	42	31	30	25	47	29	30	24	24	30	14	84	8	25
32	Gove, Charles Augustus	New Hampshire	June 5, 1871	16	11	35	44	30	28	45	29	17	9	26	39	34	24	164	8	25
40	Griffin, Thomas Dillard	Virginia	Sept. 20, 1872	17	9	42	24	43	37	32	32	42	25	42	16	10	33	8	6	11
29	Hamum, William Gangwere	Pennsylvania	Sept. 23, 1872	16	1	14	8	25	10	28	20	25	34	40	46	21	39	174	8	28
15	Henderson, Richard	North Carolina	Sept. 28, 1872	17	1	16	20	28	7	25	21	11	31	13	37	22	4	115	6	11
35	Hogg, William Stetson	At large	Sept. 24, 1872	15	10	14	40	37	28	47	5	36	40	31	29	38	30	129	6	11
16	Jardine, Augustus Edward	At large	Sept. 24, 1870	15	8	13	17	40	21	14	21	37	27	15	19	17	22	19	12	27
7	Jenkins, Stephen	New York	Sept. 20, 1871	14	2	4	24	3	13	3	2	10	15	20	5	10	12	98	8	25
9	Katz, Edward Marc	Wisconsin	June 8, 1872	16	7	19	30	15	7	17	18	18	7	12	8	6	9	182	6	11
26	Mallory, Stevenson Blount	Virginia	June 12, 1872	16	0	39	39	33	39	28	46	12	17	17	27	22	33	132	8	28
8	Mayo, Henry Thomas	Vermont	June 13, 1872	15	6	17	3	17	11	3	44	6	5	5	33	28	24	113	6	11

18	McLean, Walter	At large	June 6, 1872	16	10	9	10	19	15	9	34	19	3	22	30	34	33	104	6	11
36	Minett, Henry	Kentucky	June 8, 1872	15	9	27	11	34	35	36	12	27	37	33	38	19	28	197	6	11
27	Mulligan, Richard Thomas	New Jersey	June 5, 1871	15	0	19	37	47	23	35	31	22	28	30	22	34	15	137	11	20
25	Newton, John Thomas	At large	Oct. 14, 1872	17	0	21	27	28	25	12	19	32	35	37	21	1	44	160	6	11
37	Piepmeyer, Louis William	At large	Sept. 22, 1871	17	0	35	29	38	36	20	36	40	28	39	2	9	39	152	8	25
20	Pond, Charles Fremont	Connecticut	June 12, 1872	15	7	18	7	18	21	36	43	13	25	16	14	32	18	187	8	28
5	**Potts, Templin Morris**	At large	June 6, 1872	16	7	3	28	1	5	3	14	4	16	8	41	4	42	157	6	11
41	Proudfit, John McLean	At large	Sept. 24, 1872	17	5	21	23	36	42	30	45	34	45	40	27	45	12	131	6	11
22	Ray, Robert Clary	At large	Oct. 1, 1872	17	11	12	32	24	34	22	40	21	37	17	44	26	39	33	6	11
17	Reynolds, Lovell Knowles	Alabama	June 5, 1871	14	4	1	14	11	14	13	9	26	22	26	24	31	19	125	8	25
10	Rogers, Charles Custis	Tennessee	June 7, 1872	16	0	34	5	9	32	7	3	9	11	4	1	5	33	115	6	11
21	Rollins, Anthony Wayne	Kentucky	June 10, 1872	17	3	31	26	34	19	27	41	16	14	11	32	29	26	157	8	28
23	Rose, William Darcy	At large	June 5, 1872	15	11	32	21	7	9	22	27	24	40	22	12	39	16	128	6	11
12	Sears, James Hamilton	New York	Sept. 20, 1871	16	8	24	18	13	17	16	8	14	10	6	39	13	4	129	8	25
33	Sherman, Francis Howland	Missouri	Sept. 20, 1871	16	5	42	21	32	25	19	24	4	31	33	33	42	20	91	11	20
30	Tappan, Benjamin	Arkansas	Sept. 21, 1871	15	5	29	38	26	30	34	30	30	31	29	6	25	33	102	8	25
19	Varnum, William Lahy	Pennsylvania	June 5, 1871	16	6	5	1	27	18	15	15	34	24	19	7	40	45	81	11	20
4	**Walling, Burns Tracy**	Ohio	June 5, 1872	17	4	8	32	5	3	17	41	15	6	9	10	3	10	132	6	11
13	Winch, Thomas Garfield	Ohio	Sept. 20, 1872	17	10	10	6	23	12	11	1	19	22	20	18	22	3	94	6	11
38	Wise, Edward Everett	At large	June 5, 1871	16	6	42	32	40	41	46	34	38	42	32	3	14	2	88	8	25

CADET-MIDSHIPMEN

Second class—61 members.

Order of annual merit.	Name.	State.	Date of admission.	Age at date of admission.		Order of merit in—								Number of demerits.	Sea-service in practice-ships.	
				Years.	Months.	Seamanship.	Ordnance-instructions.	Mathematics.	Chemistry.	Rhetoric.	Physical geography.	French.	Drawing.		Months.	Days.
45	Almy, Augustus Craven	At large	June 6, 1872	15	6	42	44	35	53	40	59	39	8	129	6	24
47	Benson, William Shepherd	Georgia	Sept. 21, 1872	16	11	44	35	53	52	16	8	56	58	76	6	24
16	Bostwick, Frank Matteson	Wisconsin	Sept. 26, 1873	16	5	36	2	31	4	14	29	17	11	137	3	8
32	Brice, Jonathan Kearsley	Ohio	June 13, 1873	17	8	38	18	31	24	41	31	20	55	245	3	8
6	Bronaugh, William Venable	Kentucky	June 5, 1873	17	9	10	3	3	10	12	30	24	44	122	3	8
21	Brumby, Thomas Mason	Georgia	Sept. 26, 1873	17	10	35	17	24	15	14	5	31	26	200	3	8
51	Burdick, William Leslie	Ohio	Sept. 26, 1873	16	9	20	29	59	46	44	49	59	5	220	3	8
38	Case, Frank Blair	Michigan	June 7, 1873	15	7	9	32	37	36	53	38	54	50	223	3	8
54	Cook, Simon	Missouri	June 6, 1873	16	11	58	42	41	57	55	60	53	30	26	3	8
24	Constant, Walter Maibee	Indiana	June 13, 1873	16	3	20	4	26	36	27	16	34	54	90	3	8
7	David, William Glenn	New York	Sept. 25, 1873	17	2	10	13	10	13	4	19	14	16	169	3	8
36	Denfield, George William	Massachusetts	Sept. 26, 1873	17	1	44	45	24	40	33	40	49	48	87	3	8
26	Dodd, Arthur Wright	Indiana	June 6, 1873	16	10	51	36	13	30	43	13	10	42	93	3	8
8	Dodge, Omenzo George	Kansas	June 13, 1873	17	0	2	7	7	13	20	3	44	16	75	3	8
37	Donhaugh, Harry Mason	Ohio	June 6, 1872	16	4	23	55	29	34	50	43	58	21	118	6	24
55	Donnelly, George David	Arkansas	Sept. 23, 1872	16	6	49	59	57	28	47	53	49	12	102	6	24
41	Dunn, Herbert Omar	Rhode Island	June 6, 1873	16	0	41	34	39	28	37	33	56	10	177	3	8
43	Endress, William Fries	New York	Sept. 25, 1873	17	1	46	21	45	55	29	35	49	1	61	3	8
11	Fechteler, Augustus Francis	At large	June 5, 1873	15	0	25	31	5	34	12	54	8	4	210	3	8
35	Fletcher, Lewis Cass	Pennsylvania	June 14, 1873	16	1	20	14	49	27	58	41	26	34	178	3	8
1	**Fullam, William Freeland**	New York	Sept. 24, 1873	17	11	1	1	3	3	1	1	6	13	50	3	8
23	Gleaves, Albert	Tennessee	June 10, 1873	15	5	8	12	28	21	27	12	46	51	167	3	8

§	Grabo, Herman Francis	New Jersey	Sept. 22, 1871	16	0										6	24	
25	Grant, Albert Weston	Wisconsin	June 9, 1873	17	1	17	22	21	23	41	25	49	3	108	3	8	
§	Hall, Alfred Lovell	Ohio	Sept. 16, 1872	17	11										6	24	
22	Halpine, Nicholas John Lane Trowbridge	New York	June 9, 1871	14	8	23	47	23	31	36	13	4	39	113	6	24	
49	Harrison, Horace Wellford	At large	Sept. 24, 1872	16	9	56	55	53	41	25	42	12	49	221	6	24	
42	Heath, Frank Rives	At large	Sept. 23, 1873	16	4	55	41	30	46	31	50	36	41	79	3	8	
30	Hodges, Benjamin Ward	Mississippi	Sept. 23, 1873	17	5	52	39	35	18	6	7	20	35	101	3	8	
4	**Jeffries, Alfred**	Texas	June 9, 1873	17	9	4	25	11	17	8	4	9	16	51	3	8	
	Johnson, Henry Abert	At large	June 5, 1872	17	0										6	24	
34	Jones, David Warren	Ohio	June 8, 1872	16	7	19	49	48	26	55	27	3	42	238	6	24	
9	Jones, Henry Champion	Maine	Sept. 26, 1873	17	1	17	9	26	6	5	10	6	24	9	3	8	
19	Jordan, John Newell	Maine	June 5, 1873	17	8	4	28	20	42	35	19	34	16	134	3	8	
§	Katz, Koroku	Empire of Japan	June 7, 1871	16	4												
§	Kunitomo, Giro	Empire of Japan	Oct. 7, 1872	17	1												
52	Lansdale, Philip Van Horn	At large	June 6, 1873	15	3	52	48	41	48	46	51	55	6	109	3	8	
10	Macomb, Augustus Canfield	Kentucky	Sept. 24, 1872	17	11	14	19	8	12	45	10	13	47	247	6	24	
50	McNasser, John Henry	Wyoming	June 8, 1872	15	0	28	33	50	58	59	52	42	21	233	6	24	
57	Messinger, Lyman Bernardo	Massachusetts	Sept. 26, 1872	16	7	33	29	41	60	54	19	20	44	218	3	8	
31	Nelson, Valentine Sevier	Tennessee	June 6, 1873	17	5	39	19	33	25	18	47	26	53	148	3	8	
28	Oliver, James Harrison	Georgia	June 12, 1873	16	0	14	50	19	32	11	58	20	59	217	3	8	
5	**Orchard, John Madison**	Missouri	June 11, 1873	15	9	25	4	6	7	16	17	11	2	200	3	8	
18	Ormsby, George Francis	Ohio	Sept. 24, 1873	17	4	47	57	14	7	8	15	18	28	81	3	8	
46	Osterhout, William Bigler	Pennsylvania	June 12, 1872	17	8	37	53	40	43	30	35	33	51	204	6	24	
14	Paris, Russel Clark	New York	Sept. 23, 1873	14	1	57	10	12	5	20	54	2	31	115	3	8	
29	Parker, James Philip	North Carolina	June 6, 1873	17	8	42	15	34	50	1	23	25	31	83	3	8	
39	Rogers, Henry Horace	Illinois	June 13, 1873	17	9	50	39	41	44	20	27	36	9	67	3	8	
48	Rush, William Rees	Louisiana	June 6, 1872	14	8	25	58	47	48	50	35	47	14	237	6	24	
56	Sheeks, James David	Texas	Sept. 24, 1872	15	0	60	50	55	54	57	43	44	35	232	6	24	
13	Taylor, Hiero	Illinois	Sept. 29, 1873	17	0	48	24	9	11	24	22	19	21	122	3	8	
44	Toppan, Francis Winship	Massachusetts	Sept. 22, 1873	17	9	31	52	46	38	37	46	32	28	103	3	8	
15	Wakeushaw, Harry Charles	New Jersey	June 10, 1873	16	6	16	15	18	16	33	31	36	38	5	3	8	
53	Werlich, Percival Julius	Wisconsin	June 16, 1873	16	4	29	37	56	38	47	47	47	46	212	3	8	
17	Williams, Charles Sumner	Wisconsin	June 12, 1873	16	9	13	43	15	20	26	23	26	26	217	3	8	

§ Turned back from the first class.

CADET-MIDSHIPMEN.

Second class—61 *members*—Continued.

Order of annual merit.	Name.	State.	Date of admission.	Age at date of admission.		Order of merit in—								Number of demerits.	Sea-service in practice-ships.	
				Years.	Months.	Seamanship.	Ordnance-instructions.	Mathematics.	Chemistry.	Rhetoric.	Physical geography.	French.	Drawing.		Months.	Days.
40	Wilson, John Cochran, jr	New York	Sept. 25, 1873	16	3	29	54	37	32	47	54	16	56	221	3	8
2	Winterhalter, Albert Gustavus	Michigan	Sept. 22, 1873	16	11	7	8	2	1	1	9	1	39	47	3	8
3	Witzel, Horace Mark	Wisconsin	June 5, 1873	15	4	3	6	1	2	7	2	29	24	101	3	8
27	Wood, Albert Norton	Indiana	Sept. 24, 1873	16	6	34	26	17	19	31	18	42	35	197	3	8
33	Woodworth, Selim Edward	At large	Sept. 30, 1872	15	5	12	46	51	44	37	34	5	20	239	6	24
20	Wright, Edward Everett	Massachusetts	Sept. 20, 1873	17	0	39	22	22	22	19	25	15	14	148	3	8

Third class—53 members.

Order of annual merit.	Name	State	Date of admission.	Age at date of admission.		Order of merit in—				No. of demerits.	Sea-service in practice-ships.	
				Years.	Months.	Mathematics.	English.	History.	French.		Months.	Days.
2	**Atwater, Charles Nolson**	New York	Sept. 24, 1873	16	3	3	4	2	11	64	5	8
49	Bailey, Prentice	Kentucky	Sept. 28, 1874	17	1	49	52	61	41	146	3	0
13	Bibb, Peyton Benajah	Alabama	June 12, 1874	17	3	11	17	30	11	119	3	0
15	Biddle, Spencer Fullerton Baird	At large	June 13, 1874	15	5	9	24	26	36	98	3	0
46	Cahoon, James Blake	Vermont	June 10, 1874	17	6	52	41	33	48	160	3	0
9	Canfield, William Chase	At large	Sept. 23, 1873	16	1	12	16	10	8	81	5	8
22	Carrington, Austin Downs	Virginia	Sept. 23, 1873	17	5	20	31	22	15	159	5	8
†	Castle, Mark Cheney	Minnesota	Sept. 29, 1873	16	9	.....	.....	.....	.....	.....	3	8
17	Clark, George Ramsey	Ohio	June 9, 1874	17	3	17	20	13	30	134	3	0
39	Craven, John Eccleston	New Jersey	Sept. 24, 1874	15	10	31	54	60	30	128	3	0
50	Crosby, William	Texas	Sept. 25, 1874	16	11	51	59	57	52	140	3	0
40	Dent, Baine Caruthers	At large	June 5, 1873	16	7	37	36	49	44	246	5	8
38	Dickinson, Thomas	Kentucky	Sept. 24, 1874	16	5	42	26	41	17	228	3	0
36	Fauntleroy, Robert Powell	At large	Sept. 23, 1873	16	5	39	28	36	22	159	5	8
1	**Fillmore, John Hudson**	Illinois	Sept. 24, 1874	17	10	1	2	4	18	81	3	0
41	Garrett, Charles Warren	Indiana	June 5, 1874	17	10	46	25	33	53	155	3	0
5	**Glennon, James Henry**	California	Sept. 24, 1874	17	7	2	8	16	4	137	3	0
32	Hall, William Edward Wyatt	Maryland	June 14, 1873	17	3	29	33	51	20	184	5	8
20	Hess, George Henry	Michigan	Sept. 23, 1873	17	7	13	36	29	27	147	3	0
28	Hetherington, James Henry	Iowa	June 9, 1874	17	7	20	43	30	62	148	3	0
§	Hodges, Fletcher	Georgia	June 5, 1872	16	8	.....	.....	.....	.....	.....	3	8
8	Holcombe, John Hite Lee	At large	June 27, 1874	17	9	10	6	14	24	53	3	0

CADET-MIDSHIPMEN

Third class—53 members—Continued.

Order of annual merit.	Name.	State.	Date of admission.	Age at date of admission.		Order of merit in—				No. of demerits.	Sea-service in practice-ships.	
				Years.	Months.	Mathematics.	English.	History.	French.		Months.	Days.
33	Hooke, Horatio Hill	Illinois	Sept. 26, 1874	17	0	27	49	30	46	203	3	0
10	Hughes, Richard Morris	Pennsylvania	Sept. 25, 1874	15	8	15	8	3	16	111	3	0
25	Huse, Harry McLaren Pinkney	New York	Sept. 30, 1874	15	10	38	17	15	1	100	3	0
35	Kimmell, Harry	Pennsylvania	Sept. 28, 1874	14	5	32	36	50	28	95	3	0
4	**Knapp, Harry Shepard**	Connecticut	June 26, 1874	18	0	4	1	7	14	466	3	0
31	Knapp, John Joseph	Missouri	June 9, 1874	16	8	24	33	47	46	128	3	0
12	Lloyd, Edward, jr.	Maryland	June 17, 1874	16	11	13	13	18	5	41	3	0
42	Mason, John Greene	Ohio	June 5, 1873	17	6	36	52	53	64	141	5	8
†	Machida, Keizero	Empire of Japan	Oct. 14, 1873	16	4	.....	.....	.....	.....	.....	3	⅞
14	Mayer, Chester Alfred	New York	June 16, 1874	17	5	20	3	1	32	286	3	0
21	McClain, Charles Sumner	Indiana	Nov. 2, 1874	17	2	21	8	25	22	49	3	0
44	McDonnell, John Edmund	Nevada	Sept. 30, 1874	16	4	44	42	55	60	44	3	0
43	Poundstone, Homer Clarke	West Virginia	Sept. 24, 1874	14	0	46	36	45	41	38	3	0
26	Purcell, John Lewis	New Jersey	Sept. 29, 1873	17	4	27	43	20	28	140	5	⅞
6	Quinby, John Gardner	At large	June 12, 1874	14	10	5	12	9	19	182	3	0
3	**Rodgers, Thomas Slidell**	District of Columbia	Sept. 24, 1874	16	1	6	5	5	2	80	3	0
	Rodgers, William Ledyard	California	June 11, 1874	14	4	42½	18	15½	35½	138	.....	.....
47	Rogers, Allen Grey	North Carolina	June 12, 1874	14	6	48	35	55	49	240	3	0
48	Rowan, Andrew Summers	West Virginia	Sept. 25, 1874	17	5	52	50	33	51	148	3	0
7	Ryan, Thomas William	Pennsylvania	June 13, 1873	16	11	7	21	11	9	239	5	⅞
37	Shipley, John Harry	Missouri	Sept. 30, 1874	16	6	43	30	24	41	21	3	0
18	Skinner, Frank Colby	Massachusetts	Sept. 26, 1874	17	6	26	11	6	21	47	3	0

19	Smith, oy Campbell	Virginia	Oct. 3, 1874	16	2	18	14	39	7	55	3	
30	Sparhawk, George	Massachusetts	Sept. 24, 1874	17	6	41	21	12	24	85	3	0
16	Sprague, Frank Julian	Massachusetts	Sept. 29, 1874	17	2	16	6	17	36	260	3	0
27	Stafford, George Henry	Iowa	June 10, 1874	17	11	33	26	8	58	58	3	0
24	Tracy, Arthur Barton	New York	June 5, 1873	16	10	33	15	19	13	65	5	8
45	Webb, Lovell Hastings	Kansas	Sept. 28, 1874	17	7	49	36	52	38	173	3	0
29	White, William Porter	At large	June 30, 1874	15	5	19	61	38	41	184	3	0
11	Wright, Robert Kemp	Pennsylvania	June 12, 1873	14	8	8	19	20	9	269	5	8
23	Young, Feramorz Little	Utah	Sept. 24, 1874	16	0	23	21	27	26	42	3	0

† Re-instated.

§ Turned back from second class.

Fourth class—113 members.

Name.	State.	Date of admission.	Age at date of admission.	
			Yrs.	Mos.
Aldrich, Stuart	California	Sept. 13, 1875	17	11
Arima, Kantaro	Empire of Japan	June 4, 1874	17	3
Arnold, John Powell	Alabama	June 21, 1875	17	11
Bailey, John Bellamy	Florida	Sept. 15, 1875	16	7
Baker, Henry Edwin, jr	Mississippi	Sept. 24, 1874	17	0
Barkley, Richard Warren	Missouri	June 19, 1875	16	3
Barnard, Louis Hull	Colorado	June 13, 1874	16	11
Bartlett, David	Missouri	Sept. 13, 1875	16	5
Beale, Joseph	Pennsylvania	Oct. 12, 1874	14	10
Bell, John Arthur	West Virginia	June 13, 1874	16	11
Belmont, Oliver Hazard Perry	New York	Sept. 30, 1874	14	10
Berkeley, Francis Louis	Virginia	Sept. 14, 1875	16	4
Biddle, John Craig	Pennsylvania	Sept. 20, 1875	16	1
Bitler, Reuben Oscar	Pennsylvania	June 19, 1875	16	1
Blish, John Bell	Indiana	Sept. 15, 1875	15	0
Bliss, Herbert	Rhode Island	Sept. 15, 1875	16	7
Bonfils, Thomas Lewis	Missouri	June 19, 1875	17	8
Boon, Howard County	Missouri	June 12, 1874	17	4
Booth, Henry Driver	Delaware	Sept. 14, 1875	15	1
Bowdon, Frank Welch	Texas	Sept. 11, 1875	17	7
Boyd, John Platt	New York	Sept. 26, 1874	17	1
Breckinridge, Robert Jefferson	Kentucky	Sept. 15, 1875	17	3
Brown, Guy Warner	Indiana	June 19, 1875	17	2
Brown, James Stephen	Tennessee	Sept. 11, 1875	17	2
Buchanan, Wilson Wildman	Ohio	June 19, 1875	17	3
Buffington, Anson Wilder	Iowa	Sept. 15, 1875	17	5
Bullitt, Howard Henry	Kentucky	Sept. 11, 1875	17	11
Chase, Henry Sanders	Louisiana	June 21, 1875	16	10
Clements, Abner Brush	Missouri	June 21, 1875	17	6
Cockle, Rudolphus Rouse	Illinois	June 21, 1875	17	8
Cooke, Paul Byron	New York	Sept. 13, 1875	16	4
Cooper, Robert John	Indiana	Sept. 13, 1875	17	8
Cramer, Ambrose	Maryland	Sept. 28, 1874	17	6
Cunningham, Andrew Charles	New York	June 9, 1874	16	4
Dewey, Theodore Gibbs	At large	June 19, 1875	16	
Dougherty, John Allen	Missouri	June 12, 1874	16	9
Drake, James Calhoun	Arkansas	June 19, 1875	17	11
Drayton, Percival Langdon	New York	June 10, 1874	16	2
Fillebrowne, Horatio Ladd	South Carolina	June 19, 1875	16	1
Finley, Henry Marzett	Ohio	June 21, 1875	16	5
Fitzgerald, Edward Daniel	Maryland	Oct. 2, 1874	15	11
Franklin, Thomas Baber	Tennessee	Sept. 15, 1875	17	11
French, George Ross	At large	June 21, 1875	17	11
Garrett, Leigh Osborn	New York	Sept. 13, 1875	15	1
Garrett, LeRoy Mason	New York	Sept. 16, 1875	18	0
Gibbons, John Henry	Michigan	Sept. 15, 1875	16	8
Gibson, John	Kentucky	Feb. 16, 1874	18	0
Gill, William Andrew	Pennsylvania	June 21, 1875	16	5
Gilmore, Alexander Cattell	New Jersey	Sept. 15, 1875	16	9
Gorgas, Miles Carpenter	Pennsylvania	Sept. 11, 1875	14	2

Fourth class—118 *members*—Continued.

Name.	State.	Date of admission.	Age at date of admission.	
			Yrs.	Mos.
Graham, William Alfred	New York	Sept. 28, 1874	14	11
Gray, James	Illinois	Sept. 24, 1874	15	8
Gresham, William Albert	Indiana	June 19, 1875	17	3
Haines, Henry Cargill	District of Columbia	June 26, 1875	17	7
Harlow, Charles Henry	New York	Sept. 15, 1875	17	0
Harrison, George Edward	Michigan	June 19, 1875	17	11
Hasson, Alexander Ritchie	At large	June 21, 1875	15	4
Hayden, Edward Everett	Illinois	June 21, 1875	16	2
Haymond, Edgar Banford Wilson	Virginia	Sept. 14, 1875	14	6
Hill, Charles Homer	Wisconsin	Sept. 14, 1875	16	0
Hood, John	Alabama	Sept. 15, 1875	15	9
Huntoon, Fitz-Aubert	Texas	Sept. 15, 1875	16	10
Irving, Washington	New York	Sept. 14, 1875	15	0
Jackson, Samuel LeRoy	Virginia	Sept. 11, 1875	16	10
Johnston, Campbell Moore	Ohio	Sept. 13, 1875	15	10
Jones, Richard	New Jersey	June 19, 1875	16	11
Jungen, Charles William	Wisconsin	Sept. 24, 1874	15	6
Kellogg, Francis Woodruff	Connecticut	June 21, 1875	17	10
Kimball, Edward Fenno	South Carolina	June 21, 1875	15	7
King, William Nephew, jr	Georgia	June 21, 1875	17	5
Leiper, Edwards Fayssoux	Pennsylvania	June 21, 1875	16	7
Levisee, Leonidas	Louisiana	June 21, 1875	17	6
Lopez, Robert Files	Tennessee	Sept. 29, 1874	17	6
Luby, John Frazer	New York	June 21, 1875	17	11
Marsh, Charles Carleton	Indiana	Sept. 14, 1875	17	1
Maury, William O'Neil Perkins	Tennessee	Sept. 13, 1875	16	6
Maxwell, William John	At large	June 9, 1874	15	2
Meares, Frederick Parkhouse	North Carolina	Sept. 25, 1874	16	3
Menefee, Daniel Preston	California	Sept. 25, 1874	16	6
Miner, Randolph Huntington	Ohio	June 19, 1875	15	7
Moore, John McConnell	Indiana	June 21, 1875	17	6
Morey, Alfred George	Louisiana	Sept. 25, 1874	16	11
Morse, William	New York	Sept. 15, 1875	17	11
Mudd, John Alexis	Missouri	Sept. 11, 1875	15	3
Norris, Calvin Columbus Jackson	Idaho Territory	Sept. 15, 1875	17	8
O'Connell, James	Maine	Sept. 13, 1875	17	5
Offley, Edward Hilton	District of Columbia	June 23, 1875	15	5
Ord, Edward Otho Cresap	Nebraska	Sept. 13, 1875	16	10
Parsons, Frank Bailey	Massachusetts	Sept. 15, 1875	17	6
Paxton, Alfred Noble	Ohio	Sept. 24, 1874	17	4
Perkins, Con Marrast	Georgia	Sept. 11, 1875	14	11
Porter, John Pryor	Texas	Sept. 11, 1875	16	2
Preble, George Henry Rittenhouse	At large	Sept. 28, 1874	15	2
Read, Maurice Lance	South Carolina	Sept. 28, 1874	15	10
Redfern, Joseph Louis	At large	July 13, 1874	17	11
Ripley, Charles Stedman	At large	June 17, 1875	17	11
Robinson, Herbert Judson	New Hampshire	Sept. 15, 1875	16	6
Rolman, Hugh	Kentucky	Sept. 13, 1875	16	8
Russell, William Worthington	Maryland	Sept. 11, 1875	16	9

CADET-MIDSHIPMEN.

Fourth class—118 *members*—Continued.

Name.	State.	Date of admission.	Age at date of admission.	
			Yrs.	Mos.
Saunders, Nat	Texas	June 11, 1875	15	11
Schrum, James Albert	Illinois	Sept. 14, 1875	16	2
Schweriu, Rennie Pierre	New York	Sept. 25, 1874	16	1
Scott, George Andrew	Indiana	June 21, 1875	17	0
Sears, Walter Jesse	Pennsylvania	June 21, 1875	17	8
Sloan, Robert Sage	New York	June 21, 1875	15	7
Snowden, Thomas	New York	June 21, 1875	17	10
Starkloff, Emile Arthur von	Missouri	July 31, 1875	17	11
Sturdevant, Harry Leland	Maine	June 13, 1874	17	8
Swift, Franklin	Massachusetts	June 9, 1874	16	1
Thom, William Arthur	At large	June 21, 1875	17	8
Thompson, Edward Clinton	Pennsylvania	Sept. 13, 1875	17	4
Tillmann, Edwin Hord	Tennessee	Sept. 14, 1875	16	10
Webster, Edwin Belden	Connecticut	Sept. 28, 1874	16	6
Welsh, George Silvis	Pennsylvania	Sept. 24, 1874	17	7
Wike, Harvey	Illinois	Sept. 16, 1875	14	5
Wilkinson, Ernest	Louisiana	June 19, 1875	17	3
Winchester, William Simpson	Indiana	Aug. 10, 1875	18	0
Woodworth, Frederick Augustus	California	June 19, 1875	16	8

CADET-ENGINEERS.

Graduating class, 1875—16 *members*.

Order of general merit.	Name.	State.	Date of admission.	Age at date of admission.		Order of merit in—						No. of demerits.	Sea service in practice-ships.	
				Years.	Months.	Steam.	Electricity.	Chemistry.	Heat.	Applied mathematics.	French.		Months.	Days.
*1	Bailey, Frank Hughes	Pa	Oct. 1, 1873	22	3	1	3	3	2	1	16	0	3	9
*2	Cowles, William	N. Y	Oct. 1, 1873	18	7	2	2	5	7	2	12	12	3	9
*3	Willitts, George Sidney	Pa	Oct. 1, 1873	20	6	3	6	7	9	2	5	1	3	9
*4	Cathcart, William Ledyard	Conn	Oct. 1, 1873	18	1	4	5	4	5	7	4	21	3	9
*5	Worthington, Walter Fitzhugh	Md	Oct. 1, 1873	18	6	8	11	1	8	10	2	1	3	9
6	Little, William Nelson, jr	Ga	Oct. 1, 1872	19	8	6	4	9	11	11	11	71	6	5
7	Warburton, Edgar Townsend	Pa	Oct. 1, 1872	17	3	8	8	2	1	5	8	3	3	9
8	Burgdorff, Theodore Frederick	N. J	Oct. 1, 1873	18	9	10	1	13	4	8	6	48	3	9
9	King, William Richard	Md	Oct. 1, 1872	19	9	15	12	16	10	4	12	80	6	5
10	Freeman, Edward Russell	Miss	Oct. 1, 1873	19	9	12	10	12	6	13	7	46	3	9
11	Babbitt, George Henry Thomas	Ohio	Oct. 1, 1873	17	2	11	9	10	13	6	8	86	3	9
12	Eldridge, Frank Harold	Ohio	Oct. 1, 1872	20	2	5	6	10	12	14	15	3	6	5
13	Kleckner, Charles	Pa	Oct. 1, 1871	18	7	14	14	8	3	12	14	58	6	5
14	De Ruiz, Alberto	Pa	Oct. 1, 1873	20	5	16	15	15	16	15	1	126	3	9
15	Loomis, Edmund Underwood	Md	Oct. 1, 1872	21	3	13	12	14	15	9	10	42	3	9
†16	Boggs, William Brenton	D. C	Oct. 1, 1871	19	11	7	16	6	14	15	3	55	6	5

†Graduated September, 1875.

CADET-ENGINEERS.

First class—3 members.

Order of annual merit.	Name.	State.	Date of admission.	Age at date of admission.		Order of merit in—			No. of demerits.	Sea-service in practice-ships.	
				Years.	Months.	Mathematics.	Steam.	French.		Months.	Days.
1	Dunning, William Batey	N. Y.	Oct. 1, 1873	19	2	1	1	2	46	3	9
2	Reid, Robert Ingersoll	Pa.	Oct. 1, 1872	20	2	2	3	1	65	3	9
3	Stivers, Henry Hicks	N. Y.	Oct. 1, 1873	18	0	3	2	3	31	3	9

CADET-ENGINEERS.

Third class—17 members.

Order of annual merit.	Name.	State.	Date of admission.	Age at date of admission.		Order of merit in—				No. of demerits.	Sea-service in practice ships.	
				Years.	Months.	Mathematics.	Grammar.	History and composition.	French.		Months.	Days.
4	Bartlett, Frank William	Mich.	Oct. 1, 1874	18	1	6	4	6	3	113	2	9
11	Bieg, Frederick Charles	Mo.	Oct. 1, 1874	18	6	12	14	10	4	31	2	9
3	Bull, Goold Hoyt	Pa.	Oct. 1, 1874	18	4	3	9	7	5	115	2	9
17	Burd, George Eli	Mass.	Oct. 1, 1874	17	5	20	15	21	20	56	2	9
12	Cooley, Mortimer Elwyn	N. Y.	Oct. 1, 1874	19	6	9	13	17	9	65	2	9
16	Dungan, Horace Greeley	Iowa	Oct. 1, 1874	20	6	17	21	20	14	38	2	9
6	Gage, Howard	Mich.	Oct. 1, 1874	18	1	7	6	2	10	41	2	9
13	Gow, John London	Ind.	Oct. 1, 1874	18	4	10	6	16	19	68	2	9
9	Griffin, Robert Stanislaus	Va.	Oct. 1, 1874	17	0	8	12	18	6	43	2	9
1	Hollis, Ira Nelson	Ky.	Oct. 1, 1874	18	6	1	1	1	1	34	2	9
14	Ivers, Henry King	Mo.	Oct. 1, 1874	18	6	16	8	3	16	9	2	9
7	McElroy, George Wightman	Mich.	Oct. 1, 1874	16	6	5	10	9	13	136	2	9
15	Pickrell, Joseph McCall	Va.	Oct. 1, 1874	17	2	11	19	13	12	105	2	9
2	Schell, Franklin Jacob	Pa.	Oct. 1, 1874	17	1	2	4	5	8	6	2	9
5	Spangler, Harry Wilson	Pa.	Oct. 1, 1874	16	9	4	3	11	11	56	2	9
10	Wight, Charles Leslie	Mass.	Oct. 1, 1874	21	1	13	11	4	7	8	2	9
8	Wilmer, Joseph Ringgold	Md.	Oct. 1, 1874	20	10	14	2	8	2	37	2	9

Fourth class—28 *members.*

Name.	State.	Date of admission.	Age at date of admission.		Relative standing determined at examination for appointment.
			Years.	Months.	
Acker, Edward O'Connor	Pennsylvania	Sept. 15, 1875	17	4	23
Annan, John Wesley	Massachusetts	Sept. 15, 1875	19	0	8
Baker, John Howard	Rhode Island	Sept. 15, 1875	18	0	18
Bartholow, Frank La Motte	Ohio	Sept. 15, 1875	18	8	7
Bennett, Frank Marion	Michigan	Oct. 1, 1874	17	5	15
Bevington, Martin	Ohio	Sept. 15, 1875	17	10	19
Bowles, Francis Tiffany	Massachusetts	Sept. 15, 1875	16	11	3
Bowers, Frederick Clay	New Jersey	Sept. 15, 1875	17	7	14
Bryan, Benjamin Chambers	New Jersey	Sept. 15, 1875	17	1	12
Carr, Clarence Alfred	Pennsylvania	Sept. 15, 1875	19	1	24
Crygier, John Ulysses	New York	Oct. 1, 1874	16	6	10
Elseffer, Harry Smith	Iowa	Oct. 1, 1874	19	3	28
Gatewood, Richard	Virginia	Sept. 15, 1875	15	11	2
Harrison, Henry Fillmore	Maryland	Oct. 1, 1874	18	9	27
Hogan, Thomas Joseph	Georgia	Oct. 1, 1874	18	10	22
Hunt, Andrew Murray	Indiana	Sept. 15, 1875	16	2	17
Isbester, Richard Thornton	Tennessee	Sept. 15, 1875	18	3	25
Lubbe, Charles Bethel	Pennsylvania	Sept. 15, 1875	18	3	16
McFarland, Walter Martin	District of Columbia	Sept. 15, 1875	16	1	5
Mercier, David Isaiah	Virginia	Sept. 15, 1875	19	1	13
Noell, Michael Daniel	Pennsylvania	Sept. 15, 1875	17	5	4
Norton, Harold Percival	New York	Oct. 1, 1874	18	10	26
Salisbury, George Robert	Mississippi	Oct. 1, 1874	19	7	6
Scribner, Edward Herschell	Massachusetts	Oct. 1, 1874	19	11	11
Smith, William Strother	Virginia	Sept. 15, 1875	18	0	9
Talcott, Charles Gratiot	Virginia	Sept. 15, 1875	16	0	20
Temple, Arthur Wallace	Massachusetts	Sept. 15, 1875	20	9	1
Yarnall, John Hepburn	District of Columbia	Sept. 15, 1875	19	1	21

SUMMARY.

Academic year 1875–76.

CADET-MIDSHIPMEN.

First class	42 members.	
Second class	61 members.	
Third class	53 members.	
Fourth class	118 members.	
		274

CADET-ENGINEERS.

First class	3 members.	
Third class	17 members.	
Fourth class	28 members.	
		48
Total		322

Students from the Empire of Japan are received for instruction under a resolution of the Senate and House of Representatives of the United States, approved July 27, 1868.

RESIGNATIONS, DISMISSALS, AND DEATHS.

RESIGNATIONS.

Cadet-Midshipman A. B. Frenzel	Jan. 11, 1875
Cadet-Midshipman T. N. Wood	Feb. 4, 1875
Cadet-Midshipman J. H. Dykeman	Feb. 12, 1875
Cadet-Midshipman E. R. Poland	Feb. 26, 1875
Cadet-Midshipman William Green	Mar. 2, 1875
Cadet-Midshipman S. L. Blodgett	Mar. 25, 1875
Cadet-Midshipman P. O. Conger	Mar. 25, 1875
Cadet-Midshipman C. W. Horton	April 10, 1875
Cadet-Midshipman S. M. Peacock	May 11, 1875
Cadet-Midshipman J. A. Perry	June 1, 1875
Cadet-Midshipman F. H. Duer	June 12, 1875
Cadet-Midshipman T. B. Maynadier	June 22, 1875
Cadet-Midshipman D. Bartlett	June 22, 1875
Cadet-Midshipman L. E. Cummings	June 22, 1875
Cadet-Midshipman A. G. Gray	June 22, 1875
Cadet-Midshipman A. B. Guinnip	June 22, 1875
Cadet-Midshipman A. J. Maury	June 22, 1875
Cadet-Midshipman W. W. Picking	June 22, 1875
Cadet-Midshipman Sam Richardson	June 22, 1875
Cadet-Midshipman B. W. Taylor	June 22, 1875
Cadet-Midshipman E. H. Tillman	June 22, 1875
Cadet-Midshipman L. V. Wilson	June 22, 1875
Cadet-Midshipman O. J. Schoolcraft	Aug. 10, 1875
Cadet-Midshipman F. L. Godfrey	Aug. 24, 1875
Cadet-Midshipman E. C. Condict	Sept. 4, 1875
Cadet-Midshipman F. S. Buckley	Sept. 14, 1875

WITHDRAWN.

Japanese student Hidemaro Namboo	Jan. 5, 1875

DISMISSALS.

Cadet-Midshipman John D. Chase, dropped	Oct. 10, 1874
Cadet-Midshipman B. W. Parker, dropped	Oct. 10, 1874
Cadet-Midshipman George Van Horne, dropped	Jan. 5, 1875
Cadet-Midshipman George E. Perry, dropped	Mar. 10, 1875
Cadet-Midshipman John Hood, dismissed	Feb. 10, 1875
Cadet-Midshipman Lawson D. Melton, dismissed	Feb. 10, 1875
Cadet-Engineer Gordon H. Claude, dismissed	Feb. 23, 1875
Cadet-Midshipman Charles R. Breck, dismissed	Jan. 26, 1875
Cadet-Midshipman Wilson L. Todd, dismissed	July 23, 1875
Cadet-Engineer Henry O'Connor, dropped	Oct. 4, 1875

DEATHS.

Cadet-Midshipman Carshena Wallace	Dec. 23, 1874
Cadet-Midshipman William H. Cox	April 14, 1875
Cadet-Midshipman Mark Bridgers	July 9, 1875

SUMMER-CRUISE, 1875.

REAR-ADMIRAL C. R. P. RODGERS, COMMANDING SQUADRON.

OFFICERS AND CADET-MIDSHIPMEN

ATTACHED TO THE

UNITED STATES PRACTICE-SHIP CONSTELLATION.

Commander EDWARD TERRY, *Commanding.*
Lieutenant-Commander C. M. CHESTER, *Executive Officer.*
Lieutenant-Commander S. H. BAKER, *Navigator.*
Lieutenant C. S. SPERRY, *Senior Watch-Officer.*
Lieutenant S. A. SIMONS, *Watch-Officer.*
Lieutenant E. P. WOOD, *Watch-Officer.*
Lieutenant C. C. CORNWELL, *Watch-Officer.*
Lieutenant R. P. RODGERS, *Instructor in Navigation.*
Lieutenant J. B. BRIGGS, *Watch-Officer.*
Chaplain J. R. MATTHEWS.
Paymaster EDWARD MAY.
Surgeon T. N. PENROSE.
Assistant Surgeon J. C. BOYD.
Boatswain ANDREW MILNE.
Gunner ROBERT SOMMERS.
Clerk to Commandant of Cadets, C. M. McLEOD.
Paymaster's Clerk, W. H. ROACH.

CADET-MIDSHIPMEN.

First class (42).

W. H. Allen.	J. C. Gilmore.	W. McLean.	A. W. Rollins.
C. J. Boush.	C. A. Gove.	H. Minett.	W. D. Rose.
W. Brannersreuther.	T. D. Griffin.	R. T. Mulligan.	J. H. Sears.
S. J. Brown.	W. G. Hannum.	J. T. Newton.	F. H. Sherman.
D. R. Case.	R. Henderson.	L. W. Piepmeyer.	Benjamin Tappan.
W. J. Chambers.	W. S. Hogg.	C. F. Pond.	W. L. Varnum.
D. W. Coffman.	A. E. Jardine.	T. M. Potts.	B. T. Walling.
A. E. Culver.	S. Jenkins.	J. M. McL. Proudfit.	T. G. Winch.
E. N. Fisher.	E. M. Katz.	R. C. Ray.	E. E. Wise.
G. E. Foulk.	S. B. Mallory.	L. K. Reynolds.	
H. C. Gearing.	H. T. Mayo.	C. C. Rogers.	

Second class (1).

N. J. L. T. Halpine.

Third class (50).

C. N. Atwater.	J. H. Fillmore.	E. Lloyd.	F. C. Skinner.
P. Baily.	C. W. Garrett.	J. G. Mason.	R. C. Smith.
P. B. Bibb.	J. H. Glennon.	C. A. Mayer.	G. Sparhawk.
S. F. B. Biddle.	W. E. W. Hall.	C. S. McClain.	F. J. Sprague.
J. B. Cahoon.	G. H. Hess.	J. E. McDonnell.	G. H. Stafford.
W. C. Canfield.	J. H. Hetherington.	H. C. Poundstone.	W. L. Todd.
A. D. Carrington.	J. H. L. Holcombe.	J. L. Purcell.	A. B. Tracy.
G. R. Clark.	H. H. Hooke.	J. G. Quinby.	L. H. Webb.
J. E. Craven.	R. M. Hughes.	T. S. Rodgers.	W. P. White.
William Crosby.	H. McL. P. Huse.	A. G. Rogers.	R. R. Wright.
B. C. Dent.	H. Kimmell.	A. S. Rowan.	F. L. Young.
T. Dickinson.	H. S. Knapp.	O. J. Schoolcraft.	
R. P. Fauntleroy.	J. J. Knapp.	J. H. Shipley.	

Sailed from Annapolis Roads June 26; touched at Hampton Roads; proceeded thence to Buzzard's Bay, Mass.; touched at New Bedford; afterward at Newport, R. I., and visited the Torpedo Station; thence for the Chesapeake; and arrived at the Naval Academy September 17, 1875.

UNITED STATES PRACTICE-STEAMER ALERT.

Commander W. T. SAMPSON, *Commanding*.
Lieutenant-Commander O. F. HEYERMAN.
Lieutenant J. C. RICH.
Lieutenant A. V. WADHAMS.
Lieutenant W. H. EVERETT.
Master F. E. UPTON.
Ensign W. P. ELLIOTT.
Passed Assistant Surgeon H. M. MARTIN.
Assistant Paymaster W. W. BARRY.
Chief Engineer A. H. ABLE.
Passed Assistant Engineer J. L. D. BORTHWICK.
Assistant Engineer C. W. RAE.
Acting Boatswain N. P. GRACE.
Paymaster's Clerk, I. T. VAN PATTEN.
Acting Carpenter, J. S. WALTEMEYER.

CADET-ENGINEERS.

Third class (17).

F. W. Bartlett.	H. G. Dungan.	J. H. Hollis.	F. J. Schell.
F. C. Bieg.	H. Gage.	H. K. Ivers.	H. W. Spangler.
G. H. Bull.	J. L. Gow.	G. W. McElroy.	C. L. Wight.
G. E. Burd.	R. S. Griffin.	J. M. Pickrell.	J. A. Wilmer.
M. E. Cooley.			

Left her anchorage September 23; proceeded to Norfolk, Va.; touched at the navy-yard; thence to Wilmington and Edgemoor, Del.; Chester and Philadelphia, Pa.; Williamsburgh and the navy-yard, New York; Newport, R. I.; touched at Rocky Point, and visited Providence, R. I.; thence to New Bedford and Boston, where the officers and cadets belonging to the Academy were detached September 2, and the ship assigned to other service.

Table of coefficients to be applied to the final averages in each branch in preparing the merit rolls.

CADET-MIDSHIPMEN.

Department.	Subject.	Co-efficients. First year—fourth class.	Second year—third class.	Third year—second class.	Fourth year—first class.	Graduating maximum for required studies.
Seamanship	Seamanship	.....	.....	7	12	144
	Ship-Building	.....	.....	4	.....	
	Naval Tactics	.....	.....	2	.....	
	Naval Architecture	.....	.....	.....	6	
	Practical Exercises	.....	.....	.....	5	
Ordnance and Gunnery	Ordnance-Instructions	.....	.....	4	.....	76
	Infantry-Tactics	.....	.....	2	.....	
	Ordnance and Armor	.....	.....	.....	13	
Mathematics	Algebra and Geometry	9	.....	.....	.....	108
	Trigonometry, Analytical Geometry, and Descriptive Geometry	.....	18	.....	.....	
Steam-Enginery	Marine Engines	.....	.....	.....	11	44
Astronomy, Navigation, and Surveying	General Astronomy	.....	.....	6	.....	84
	Navigation and Surveying	.....	.....	.....	15	
Physics and Chemistry	Chemistry and Physics	.....	8	.....	.....	144
	Applied Mathematics and Mechanics	.....	.....	14	.....	
	Electricity	.....	.....	6	.....	
	Light and Heat	.....	.....	.....	8	
English Studies, History, and Law	English and History	6	.....	.....	.....	80
	History and Rhetoric	.....	6	.....	.....	
	Composition	.....	.....	5	.....	
	Public Law	.....	.....	.....	3	
Modern Languages	French	2	4	4	.....	64
	Spanish	.....	.....	3	3	
Drawing	Line-Drawing and Topography	2	.....	.....	.....	16
	Sketching	.....	2	.....	.....	
Maximum for each year		76	152	228	304	766
Deduction for each demerit		.004	.007	.013	.03	.....

CADET-ENGINEERS.

Seamanship	Ship-Building	.....	.....	4	.....	40
	Naval Architecture	.....	.....	.....	6	
Mathematics	Algebra and Geometry	9	.....	.....	.....	108
	Trigonometry, Analytical Geometry, and Descriptive Geometry	.....	18	.....	.....	
Steam-Enginery	Mechanical Drawing	2	2	.....	.....	240
	Fabrication of Machinery	.....	.....	21	35	
	Designing of Machinery					
	Marine Engines					
Astronomy, Navigation, and Surveying	General Astronomy	.....	.....	.....	6	24
Physics and Chemistry	Physics and Chemistry	.....	8	.....	.....	204
	Applied Mathematics and Mechanics	.....	.....	14	.....	
	Electricity	.....	.....	6	.....	
	Mechanics	.....	.....	.....	8	
	Light and Heat	.....	.....	.....	8	
	Physical Measurements	.....	.....	.....	7	
English Studies, History, and Law	English and History	6	.....	.....	.....	80
	History and Rhetoric	.....	6	.....	.....	
	Composition	.....	.....	5	.....	
	Public Law	.....	.....	.....	3	
Modern Languages	French	2	4	4	.....	64
	Spanish	.....	.....	3	3	
Maximum for each year		76	152	228	304	760
Deduction for each demerit		.004	.007	.013	.03	.....

MERIT-ROLLS FOR 1874–75.

Merit-rolls, made out yearly for each class, show the proficiency of the Cadets in each branch of study. Hereafter, the numbers given in the table, showing the relative weight of the different branches, will be used as co-efficients; the final mark in each branch (on a scale of 4) being multiplied by the number assigned to that branch. The sum of the products, after making deductions for conduct, is the final mark of the Cadet for the year.

In the case of Cadets who take an elective course in any branch, the final mark in that branch is to be determined by adding to the final mark received in the required course one-fifth of the amount by which the final mark in the elective course exceeds 2.50.

In the graduating merit-roll, the final mark for the course is determined by the sum of the four yearly marks.

The merit-rolls for the year ending June, 1875, were made by the method described in the last Academy Register.

Cadets whose names are marked thus (*) are the five most distinguished in their respective classes.

Those marked thus (†) were found deficient, but were allowed to continue in their classes on condition of passing at a re-examination.

Those marked thus (‡) were found deficient, and turned back, to recommence the studies of their respective classes.

Those marked thus (§) were found deficient, and recommended to be dropped.

a denotes absence from examination.

CADET-MIDSHIPMEN.

Merit-roll of first class (32 members), annual examination, June, 1875, and general merit-roll for four years.

Order of general merit.	Name.	Seamanship.	Practical exercises in seamanship.	Naval architecture.	Gunnery.	Fencing.	Marine engines, boilers, &c.	Astronomy and navigation.	Heat and climatology.	Optics and acoustics.	International law.	Spanish.	Conduct.	Aggregate for fourth year.	Aggregate for third year.	Aggregate for second year.	Aggregate for first year.	General aggregate for four years.
	Maxima	120	51	36	81	9	84	153	45	30	30	30	210	882	681	526	255	2311
*1	**Albon C. Hodgson**	107. 10	45. 52	36. 00	82. 13	6. 29	84. 00	153. 00	45. 00	30. 00	30. 00	30. 00	198. 45	847. 49	633. 05	496. 14	250. 67	2227. 35
*2	**Charles H. Amsden**	99. 35	51. 00	31. 35	74. 67	9. 00	78. 58	116. 81	30. 00	21. 54	17. 10	28. 06	196. 98	754. 44	614. 93	451. 82	220. 94	2042. 13
*3	**Cameron M. Winslow**	109. 68	46. 61	35. 23	80. 27	8. 61	59. 61	139. 84	34. 66	24. 62	24. 84	22. 26	204. 54	790. 77	614. 78	398. 01	146. 88	1950. 44
*4	**James M. Helm**	120. 00	44. 42	32. 90	64. 40	8. 81	82. 19	149. 71	42. 93	26. 15	27. 42	24. 19	190. 05	813. 17	506. 72	403. 78	166. 55	1890. 22
*5	**William G. Cutler**	101. 94	40. 03	30. 58	64. 40	4. 94	49. 68	136. 55	36. 72	15. 77	23. 55	29. 35	197. 40	730. 91	525. 33	375. 33	207. 57	1839. 14
6	Clarence A. Corbin	112. 26	42. 77	34. 06	72. 80	7. 65	64. 13	110. 23	25. 34	23. 47	22. 26	23. 23	185. 43	723. 63	522. 42	388. 37	203. 91	1838. 33
7	Fydelio S. Carter	117. 42	49. 35	15. 48	78. 40	8. 03	59. 61	90. 48	13. 97	19. 23	28. 71	16. 77	203. 49	700. 94	501. 27	397. 07	219. 45	1818. 73
8	Frederick W. Coffin	114. 84	34. 55	28. 26	67. 20	5. 90	53. 29	102. 00	33. 62	23. 47	29. 35	26. 77	183. 75	703. 00	506. 37	451. 95	150. 60	1811. 92
9	Harry H. Hosley	94. 19	29. 06	32. 13	48. 53	3. 58	75. 87	146. 42	43 97	14. 62	14. 52	28. 71	184. 80	716. 40	525. 55	391. 14	176. 48	1809. 57
10	Charles Laird	85. 16	41. 13	22. 84	70. 93	4. 45	68. 65	102. 00	27. 93	25. 38	21. 61	15. 16	191. 94	677. 18	572. 69	412. 75	136. 07	1798. 69
11	Walter S. Hughes	47. 74	21. 94	25. 16	48. 53	3. 97	73. 16	116. 81	32. 59	26. 92	17. 10	19. 68	204. 75	638. 35	584. 19	441. 72	134. 37	1798. 63
12	Nathaniel R. Usher	85. 16	34. 55	17. 42	55. 07	6. 87	71. 35	106. 94	20. 17	13. 85	17. 10	19. 68	187. 35	635. 69	531. 05	420. 34	206. 68	1793. 76
13	Harry M. Hodges	54. 19	31. 26	26. 32	48. 53	3. 39	56. 00	125. 03	23. 28	20. 77	15. 16	13. 87	205. 38	623. 18	499. 31	449. 90	137. 68	1710. 07
14	Frank F. Fletcher	59. 35	29. 06	23. 61	44. 80	7. 66	33. 42	116. 81	25. 34	27. 69	18. 39	18. 39	194. 67	598. 59	564. 33	318. 41	212. 71	1694. 04
15	David Daniels	104. 52	37. 84	34. 06	41. 07	5. 52	65. 94	125. 03	38. 28	12. 31	26. 13	27. 42	205. 80	723. 92	424. 74	354. 76	154. 52	1657. 94
16	Alexander Sharp	50. 32	47. 71	29. 03	59. 73	7. 26	80. 39	129. 97	39. 83	22. 31	22. 90	13. 23	203. 28	705. 96	467. 16	327. 68	157. 07	1657. 87
17	Moses L. Wood	59. 35	21. 94	20. 52	84. 00	7. 45	75. 87	83. 90	41. 90	20. 00	19. 03	24. 84	194. 88	653. 68	507. 40	318. 94	167. 11	1647. 13
18	Richard H. Townley	63. 23	24. 68	27. 48	69. 07	6. 58	62. 32	74. 03	21. 21	16. 92	15. 81	21. 61	197. 19	600. 13	461. 97	412. 81	147. 61	1622. 52
19	Edward D. Bostick	67. 10	37. 84	26. 32	59. 73	5. 71	40. 65	77. 32	30. 00	18. 07	28. 06	14. 52	193. 20	598. 52	449. 59	362. 58	198. 53	1609. 22
20	George H. Worcester	42. 58	21. 94	22. 06	76. 53	3. 97	68. 65	143. 13	40. 86	28. 46	13. 23	19. 68	190. 89	671. 98	461. 04	289. 86	143. 54	1566. 42
21	John A. Shearman	73. 55	32. 35	12. 77	26. 13	7. 84	35. 23	97. 06	19. 14	10. 00	11. 29	15. 81	180. 39	521. 56	478. 17	343. 74	215. 10	1558. 57
22	Frank E. Beatty	78. 71	29. 06	19. 74	55. 07	3. 19	51. 48	133. 26	38. 28	22. 23	19. 68	20. 97	186. 69	665. 36	400. 85	312. 25	163. 08	1541. 54
23	Robert M. Doyle	90. 32	18. 10	24. 39	33. 60	4. 74	46. 06	87. 19	35. 69	18. 07	25. 48	11. 29	192. 15	587. 08	429. 72	276. 36	173. 83	1466. 99
24	James T. Smith	54. 19	21. 94	18. 97	59. 73	4. 45	29. 81	70. 74	22. 24	9. 23	24. 19	26. 13	206. 43	548. 05	401. 36	345. 24	153. 75	1448. 40
25	Charles M. McCartney	40. 00	19. 19	21. 29	28. 00	3. 00	44. 26	93. 77	27. 93	15. 77	20. 97	25. 48	189. 21	528. 87	363. 45	375. 24	174. 59	1442. 15
26	Alfred L. Howe	81. 29	25. 77	13. 55	37. 33	3. 97	56. 00	64. 16	17. 59	13. 08	20. 32	16. 77	193. 41	543. 24	439. 88	300. 83	148. 41	1432. 36
27	Henry J. Hunt	96. 77	42. 77	18. 19	29. 87	8. 42	47. 87	60. 87	31. 55	11. 15	10. 65	10. 65	182. 70	551. 46	408. 41	284. 14	156. 14	1400. 15
28	Frank S. Collins	45. 16	17. 00	29. 81	52. 27	6. 58	37. 94	67. 45	17. 59	8. 46	26. 77	12. 26	192. 36	513. 65	363. 10	321. 34	185. 44	1383. 53
29	Ridgly Hunt	73. 55	49. 35	12. 00	35. 47	6. 10	31. 61	55. 94	25. 34	11. 15	10. 00	12. 26	183. 33	506. 10	362. 11	333. 02	157. 13	1358. 36
†	Frederick B. Vinton	67. 10	26. 87	16. 65	39. 20	5. 32	42. 45	55. 94	12. 93	7. 69	13. 87	23. 23	184. 17	495. 42	397. 24	324. 30	187. 96	1404. 92
†	William B. Caperton	73. 55	37. 84	15. 48	42. 93	8. 23	37. 94	80. 61	16. 03	6. 92	12. 26	17. 74	208. 95	558. 48	394. 43	296. 56	129. 76	1379. 23
†	George Stoney	90. 32	34. 55	14. 32	31. 73	5. 13	28. 00	51. 00	15. 00	6. 15	12. 26	10. 00	190. 68	489. 14	363. 13	243. 16	115. 77	1211. 20

Merit-roll of second class (47 members), annual examination, June, 1875.

Order of annual merit.	Name.	Seamanship.	Naval tactics.	Ship-building.	Gunnery.	Infantry-tactics.	Fencing.	Astronomy.	Magnetism and electricity.	Applied mathematics.	English composition.	French.	Drawing.	Conduct.	Aggregate.
	Maxima	99	24	24	45	30	9	45	45	120	30	60	30	120	681
*1	Stimson J. Brown	84.33	17.91	23.64	45.00	28.44	8.28	41.21	44.30	118.00	25.56	59.09	27.14	105.96	631.86
*2	George C. Foulk	97.53	23.65	22.18	44.30	26.00	7.04	39.87	40.12	109.00	28.67	50.00	26.67	111.48	626.51
*3	Henry C. Gearing	90.93	18.78	20.91	42.91	29.78	6.91	45.00	45.00	120.00	24.89	53.64	19.52	105.48	623.75
*4	Burns T. Walling	88.73	12.52	22.55	43.60	22.67	3.72	33.95	41.51	104.00	26.00	58.18	25.72	104.16	587.31
*5	Templin M. Potts	96.07	14.61	24.00	42.21	28.44	7.30	42.24	34.53	106.00	12.00	57.27	10.24	101.16	576.07
6	William H. Allen	63.80	22.96	21.45	41.51	29.78	5.54	43.42	42.91	102.00	21.78	47.27	16.90	115.18	574.50
7	Stephen Jenkins	94.60	15.83	23.27	36.63	28.44	8.87	37.89	35.23	84.00	28.22	51.36	24.52	108.24	574.10
8	Henry T. Mayo	75.53	23.30	18.18	38.02	28.44	3.39	41.05	42.21	112.00	15.33	35.45	18.81	106.44	558.15
9	Edward M. Katz	71.87	13.74	18.73	40.47	22.67	6.78	31.58	40.81	98.00	26.67	55.45	26.19	98.16	551.12
10	Charles C. Rogers	50.60	22.61	20.91	23.02	27.33	8.74	38.68	38.02	114.00	30.00	56.36	13.57	106.20	550.04
11	Clifford J. Boush	90.93	19.13	22.91	26.86	26.89	5.87	27.63	32.44	94.00	16.89	43.18	25.24	112.56	544.53
12	James H. Sears	63.80	17.91	19.64	33.84	23.33	8.09	34.74	38.72	109.00	12.89	49.09	28.33	104.52	543.90
13	Thomas G. Winch	85.80	22.26	16.00	37.33	25.56	9.00	30.39	30.00	81.00	22.44	40.00	29.05	108.72	537.55
14	Abraham E. Culver	36.67	20.17	16.55	34.88	13.11	4.37	39.87	33.49	116.00	26.67	54.55	22.38	112.92	541.63
15	Richard Henderson	77.00	17.39	14.00	40.47	19.11	6.33	37.11	23.37	96.00	14.00	40.00	28.33	106.20	519.31
16	Augustus E. Jardine	81.40	18.43	9.64	30.70	24.22	6.33	16.58	26.86	92.00	21.78	45.00	20.00	117.72	510.66
17	Lovell K. Reynolds	99.00	19.48	20.18	35.93	24.67	7.96	25.26	30.00	69.00	19.33	32.73	21.43	105.00	509.97
18	Walter McLean	87.27	20.87	17.45	34.88	26.44	4.63	30.39	43.60	77.00	16.89	28.64	13.57	107.52	509.15
19	William L. Varnum	94.13	24.00	14.55	33.14	23.78	7.17	18.55	28.95	84.00	27.33	24.55	9.05	110.28	498.48
20	Charles F. Pond	74.07	21.91	17.82	30.70	14.22	3.52	35.53	27.91	90.00	24.22	31.82	21.90	97.56	491.18
21	Anthony W. Rollins	55.00	15.30	11.82	32.09	18.44	3.72	33.16	35.93	102.00	16.22	34.55	17.86	101.16	475.25
22	Robert C. Ray	82.87	12.52	15.64	21.98	20.35	3.91	29.21	19.53	87.00	10.89	37.27	11.43	116.04	468.64
23	William D. Rose	52.80	16.87	21.82	39.42	20.35	5.54	26.84	17.44	77.00	24.89	25.45	22.86	104.64	455.92
24	John T. Newton	68.93	14.96	14.00	27.91	25.11	6.65	20.53	21.28	48.00	21.11	60.00	9.52	100.80	438.80
25	Stevenson B. Mallory	43.27	10.78	12.36	18.49	17.78	3.13	36.32	33.49	87.00	18.22	40.00	13.57	104.16	438.57
26	Richard T. Mulligan	71.87	11.48	7.27	29.30	14.89	5.09	28.42	25.81	62.00	20.44	28.64	23.33	103.56	432.10
27	James C. Gillmore	52.80	9.74	13.09	24.42	19.11	3.00	22.89	24.77	74.00	19.78	33.64	23.81	109.92	430.97
28	William G. Hannum	79.20	21.57	15.27	38.72	17.78	6.52	26.05	21.98	41.00	10.00	41.82	11.43	99.12	430.46
29	Benjamin Tappan	57.93	11.13	14.91	24.42	15.33	5.22	22.11	23.37	64.00	27.78	38.18	13.57	107.76	425.71
30	De Witt Coffman	41.80	12.52	19.27	32.09	12.22	8.28	21.32	31.05	66.00	11.33	30.91	17.86	110.64	415.29

Cadet-midshipmen—Merit-roll of second class—Continued.

Order of annual merit.	Name.	Seamanship.	Naval tactics.	Ship-building.	Gunnery.	Infantry-tactics.	Fencing.	Astronomy.	Magnetism and electricity.	Applied mathematics.	English composition.	French.	Drawing.	Conduct.	Aggregate.
	Maxima	99	24	24	45	30	9	45	45	120	30	60	30	120	681
31	Charles A. Gove	48.40	9.04	13.45	25.81	10.44	5.35	32.37	39.42	69.00	12.89	28.64	18.81	100.32	413.94
32	Francis H. Sherman	36.67	16.87	12.73	27.91	22.00	6.00	42.24	23.37	53.00	15.33	22.27	20.95	109.08	408.42
33	Daniel R. Case	56.47	21.22	17.09	19.19	21.11	6.13	23.68	31.74	46.00	15.33	36.36	15.24	96.84	406.40
34	William S. Hogg	79.20	10.43	10.91	25.81	9.56	8.48	17.37	17.44	60.00	17.56	26.36	15.95	104.52	403.59
35	Henry Minett	60.13	20.17	11.82	21.28	14.22	7.50	24.47	19.53	53.00	13.56	43.18	16.90	96.36	402.12
36	Edward E. Wise	36.67	12.52	9.64	17.09	10.00	4.63	15.79	16.40	58.00	29.11	48.18	29.52	109.44	396.99
37	Elstner N. Fisher	46.20	8.70	18.73	23.02	13.56	7.70	19.74	36.63	53.00	22.89	22.27	20.48	96.84	389.76
38	John M. Proudfit	68.93	16.35	11.27	16.40	16.89	3.26	18.55	14.30	41.00	18.22	20.00	24.52	104.28	373.97
†	Washington J. Chambers	66.73	20.17	10.18	15.00	16.89	8.61	13.42	18.49	72.00	23.78	45.00	27.62	108.96	446.85
†	Louis W. Piepmeyer	48.40	14.26	10.55	20.58	21.56	4.37	14.21	25.81	44.00	29.56	52.73	11.43	101.76	399.22
†	Thomas D. Griffin	36.67	15.83	8.73	19.88	16.00	4.96	12.63	27.91	38.00	23.33	51.36	13.57	119.04	387.91
†	William Brauersreuther	60.13	8.35	20.18	17.79	16.00	7.83	10.26	20.58	53.00	12.00	28.64	13.57	103.44	371.77
†	Alfred L. Hall	44.73	12.52	16.55	29.30	19.78	4.83	15.00	37.33	34.00	9.56	23.64	8.10	100.20	355.54
†	Hermann F. Grabo	31.53	10.09	8.00	13.60	11.11	5.74	11.84	15.35	36.00	18.89	46.36	10.24	111.24	329.99
‡	Giro Kunitomo	63.80	13.74	7.64	14.30	12.67	4.11	8.68	12.91	28.00	20.44	.....	8.57	118.56	313.42
‡	Henry A. Johnson	40.33	8.00	8.36	15.70	11.78	7.50	9.47	15.35	30.00	10.44	20.91	30.00	100.43	308.28
‡	Koroku Katz	33.00	9.39	9.09	12.91	11.11	4.11	11.05	13.60	32.00	14.44	.....	15.95	102.36	269.01

CADET-MIDSHIPMEN.

Merit-roll of third class (60 members), annual examination, June, 1875.

Order of annual merit.	Name.	Seamanship.	Ordnance & instructions.	Mathematics.	Chemistry.	Rhetoric.	Physical geography.	French.	Drawing.	Conduct.	Aggregate.
	Maxima	75	48	162	45	42	33	60	18	55	538
*1	William F. Fullam	75.00	48.00	157.34	43.97	41.52	33.00	56 27	15.18	52.25	522.53
*2	Albert G. Winterhalter	69.92	44.07	160.14	45.00	41.52	29.97	60.00	8 94	52.42	511.98
*3	Horace M. Witzel	73.31	45.19	162.00	44.48	39.10	32.62	40.68	12.47	49.45	499.30
*4	Alfred Jeffries	72.03	34.53	143.38	36.72	38.38	31.86	54.58	14.12	52.20	477.80
*5	John M. Orchard	53.81	46.03	152.69	41.64	34.52	26.93	53.22	17.76	44.00	470.60
6	William V. Bronaugh	66.95	46.88	157.34	40.34	36.45	32.00	44.41	7.76	48.29	470.42
7	William G. David	66.95	41.26	145.24	38.53	40.55	25.79	51.19	14.12	45.71	469.34
8	Omenzo G. Dodge	74.15	44.63	150.83	38.53	32.34	32.24	30.51	14.12	50.88	468.23
9	Henry C. Jones	61.02	43.51	114.52	42.44	40.07	29.40	56.27	12.47	54.51	454.18
10	Augustus C. Macomb	63.56	37.61	148.97	39.31	20.76	29.40	51.86	7.18	41.42	440.07
11	Augustus F. Fechteler	53.81	31.16	154.55	27.67	36.45	12.52	55.25	17.29	43.45	432.15
12	Frank S. Buckley	48.73	42.39	135.00	40.86	37.66	31.29	33.22	10.71	50.82	430.68
13	Hiero Taylor	35.17	35.09	147.10	39.83	30.90	25.03	47.80	13.06	48.29	422.27
14	Russel C. Paris	27.54	42.95	141.52	42.93	32.34	12.52	59.32	10.71	48.68	418.51
15	Harry C. Wakenshaw	62.29	39.86	130.34	37.24	26.31	21.43	35.59	9.29	54.73	417.08
16	Frank M. Bostwick	45.34	47.44	105.21	43.45	35.48	32.38	49.15	15.65	47.47	411.57
17	Charles S. Williams	64.83	24.42	135.00	35.17	29.93	24.47	42.37	12.00	43.07	411.26
18	George F. Ormsby	36.02	16.56	137.79	41.64	38.38	27.69	48.47	11.53	50.55	408.63
19	John N. Jordan	72.03	32.84	126.62	23.79	25.59	25.79	37.29	14.12	47.63	405.70
20	Edward E. Wright	42.37	35.93	122.90	34.14	33.31	23.71	50.51	14.82	46.86	404.55
21	Thomas M. Brumby	46.19	39.02	118.24	37.76	35.48	31.29	39.66	12.00	44.00	403.64
22	Nicholas J. L. T. Halpine	55.93	22.18	121.03	39.48	25.10	28.26	57.97	8.94	48.79	397.68
23	Albert Gleaves	69.07	41.82	111.72	34.66	29.24	28.83	29.49	6.12	45.82	396.74
24	Walter M. Constant	58.05	46.03	114.52	26.64	29.24	27.31	37.29	5.53	50.05	394.63
25	Albert W. Grant	61.02	35.93	124.76	33.62	22.45	23.71	26.44	17.53	49.06	394.52
26	Arthur W. Dodd	32.63	28.35	139.66	30.00	21.72	28.26	53.90	8.24	49.89	392.65
27	Albert N. Wood	47.03	33.96	132.21	35.69	27.28	26.55	31.86	9.76	44.17	389.51
28	James H. Oliver	63.56	20.21	128.48	28.71	37.17	11.38	46.10	4.35	43.07	383.03
29	James P. Parker	39.83	39.86	110.55	19.66	41.52	24.47	43.73	10.71	50.44	370.77
30	Benjamin W. Hodges	30.93	26.39	97.76	36.21	39.59	30.72	46.10	9.76	49.45	366.91
31	Valentine S. Nelson	42.37	37.61	102.41	32.59	33.79	15.36	42.37	5.76	46.86	359.12
32	Jonathan K. Brice	43.64	38.46	105.21	33.10	22.45	21.43	46.10	5.29	41.53	357.21
33	Selim E. Woodworth	65.68	22.74	67.97	22.50	24.14	20.48	57.29	13.53	41.86	336.19
34	David W. Jones	59.75	21.05	74.48	32.07	15.69	22.95	58.64	8.24	41.91	334.78
35	Lewis C. Fletcher	58.05	40.70	72.62	31.55	14.48	17.83	42.37	10.24	45.21	333.05
36	George W. Denfeld	38.14	24.30	118.24	24.83	26.31	18.21	26.44	6.94	50.92	332.63
37	Harry M. Dombaugh	55.93	17.40	109.86	27.67	18.10	16.88	21.36	13.06	48.51	328.77
38	Frank B. Case	68.22	30.60	94.03	26.64	16.90	18.78	24.07	6.47	42.74	328.45
39	Henry H. Rogers	33.47	26.39	84.72	22.50	32.34	22.95	35.59	16.12	51.32	325.40
40	John C. Wilson, jr.	50.85	18.25	94.03	28.71	19.31	13.52	49.83	5.06	42.85	321.41
41	Herbert O. Dunn	41.10	29.47	91.24	30.78	24.14	20.86	32.37	15.88	45.27	321.11
42	Frank R. Heath	29.24	25.54	108.00	21.47	27.28	14.41	35.59	8.59	50.66	320.78
43	William F. Endress	36.86	36.77	80.07	17.07	28.48	19.72	26.44	18.00	51.65	315.06
44	Frank W. Toppan	49.58	19.37	78.21	25.60	24.14	15.93	38.98	11.53	49.34	312.68
45	Augustus C. Almy	39.83	23.86	97.76	18.10	23.17	11.00	34.24	16.35	47.91	312.22
46	William B. Osterhaut	44.49	18.81	89.38	23.28	28.00	19.72	38.31	6.12	43.78	311.89
47	William S. Benson	38.14	28.91	64.24	18.62	34.52	30.34	22.37	4.59	50.82	292.55
48	William R. Rush	53.81	16.60	76.34	20.43	18.10	19.72	28.47	14.82	41.97	289.66
49	Horace W. Harrison	28.39	17.40	64.24	24.31	30.41	17.45	52.54	6.71	42.85	284.30
50	John H. McNasser	52.12	30.04	70.76	15.52	14.00	13.66	31.86	13.06	42.19	283.21
51	William L. Burdick	58.05	32.00	54.00	21.47	21.24	14.79	30.34	17.06	42.90	281.85
52	Philip V. H. Lansdale	30.93	21.61	84.72	20.43	20.28	14.03	23.39	16.71	49.01	281.11
53	Percival J. Werlich	50.85	27.51	59.59	25.60	19.31	15.36	28.47	7.41	43.34	277.44
54	Simon Cook	26.69	24.98	84.72	16.03	15.69	10.62	24.75	11.18	58.57	268.23
55	George D. Donnelly	34.32	15.44	56.79	30.78	19.31	13.28	26.44	15.41	49.39	261.16
56	James D. Sheeks	25.00	20.21	61.45	17.59	14.97	16.88	30.51	9.76	42.24	238.61
†	Lyman B. Messinger	47.88	32.00	84.72	14.48	16.41	25.79	46.10	7.76	43.01	318.15
§	Thomas B. Maynadier	70.76	33.40	67.97	19.14	13.52	11.76	20.34	4.82	41.69	283.40
†	Fletcher Hodges	30.93	14.88	56.79	16.55	31.38	16.31	40.68	4.12	42.68	254.32
‡	Oliver J. Schoolcraft	25.85	27.51	52.14	15.00	17.38	18.78	33.22	16.71	41.91	248.50

CADET-MIDSHIPMEN.

Merit-roll of fourth class (94 members), annual examination, June, 1875.

Order of annual merit.	Name.	Mathematics.	English.	History.	French.	Conduct.	Aggregate.
	Maxima	120	30	42	24	15	231
*1	John H. Fillmore	120.00	29.64	40.38	19.23	13.79	223.04
*2	Charles N. Atwater	116.92	28.93	41.46	21.05	14.04	222.40
*3	Thomas S. Rodgers	112.31	28.57	39.85	23.72	13.80	218.25
*4	Harry S. Knapp	115.38	30.00	38.77	20.35	12.54	217.04
*5	James H. Glennon	118.46	27.14	33.92	23.16	12.95	215.63
6	John G. Quinby	113.85	26.07	37.69	18.95	12.27	208.83
7	Thomas W. Ryan	110.77	22.50	36.62	21.61	11.42	202.92
8	J. H. L. Holcombe	106.15	28.04	35.00	17.40	14.21	200.80
9	William C. Canfield	103.08	24.64	37.15	22.04	13.79	200.70
10	Richard M. Hughes	98.46	27.14	40.92	19.79	13.34	199.65
11	Robert K. Wright	109.23	23.57	31.80	21.61	10.97	196.88
12	Edward Lloyd, jr	100.77	25.71	32.85	22.88	14.39	196.60
13	Payton B. Bibb	104.62	24.11	25.85	21.05	13.22	188.85
14	Chester A. Mayer	89.23	29.29	42.00	15.16	10.71	186.39
15	Spencer F. B. Biddle	107.69	21.79	28.54	14.60	13.53	186.15
16	Frank J. Sprague	96.92	28.04	33.38	14.60	11.10	184.04
17	George R. Clark	95.38	23.21	35.54	15.72	12.99	182.84
18	Frank C. Skinner	81.54	26.43	39.31	18.39	14.30	179.97
19	Roy C. Smith	93.85	25.36	24.54	22.32	11.18	177.25
20	George H. Hess	100.77	16.79	26.92	16.70	12.80	173.98
21	Charles S. McClain	83.85	27.14	29.08	17.96	14.27	172.30
22	Austin D. Carrington	89.23	19.29	30.42	20.07	12.62	171.63
23	Feramorz L. Young	86.15	22.50	27.73	16.98	14.37	167.73
24	Arthur B. Tracy	69.23	25.00	32.31	20.63	14.03	161.20
25	Harry McL. P. Huse	63.08	24.11	34.46	24.00	13.50	159.15
26	John L. Purcell	79.23	14.82	31.50	16.28	12.90	154.73
27	George H. Stafford	69.23	20.89	38.23	8.84	14.13	151.32
28	James H. Hetherington	89.23	14.82	25.85	8.00	12.78	150.68
29	William P. White	92.31	10.36	22.08	13.05	12.24	150.04
30	George Sparhawk	58.46	22.50	36.08	17.40	13.73	148.17
31	John J. Knapp	83.85	18.39	18.31	11.79	13.68	145.42
32	William E. W. Hall	76.92	18.39	16.69	18.67	12.24	142.91
33	Horatio H. Hooke	79.23	13.57	25.85	11.79	11.96	142.40
34	William L. Todd	75.38	12.68	22.62	15.16	11.61	137.45
35	Harry Kimmell	72.31	16.79	17.23	16.28	13.58	136.19
36	Robert P. Fauntleroy	60.77	20.18	23.15	17.96	12.62	134.68
37	John H. Shipley	55.38	19.64	29.62	12.35	14.69	131.68
38	Thomas Dickinson	56.92	20.89	20.73	19.51	11.58	129.63
39	John E. Craven	73.85	11.43	11.85	15.72	13.08	125.93
40	Baine C. Dent	64.62	16.79	17.77	12.35	11.31	122.84
41	Charles W. Garrett	50.00	21.43	24.23	9.54	12.68	117.88
42	John Greene Mason	66.15	11.96	15.35	7.72	12.89	114.07
43	Homer C. Poundstone	50.00	16.79	19.12	13.05	14.43	113.39
44	John E. McDonnell	53.85	15.36	14.27	8.56	14.34	106.38
45	Lovell H. Webb	45.38	16.79	16.15	14.18	12.41	104.91
46	James L. Cahoon	40.77	15.71	24.23	11.37	12.69	104.68
47	Allen G. Rogers	47.69	17.86	14.27	10.95	11.85	102.62
48	Andrew S. Rowan	40.77	12.68	24.23	10.53	12.78	100.99
49	Prentice Bailey	45.38	11.96	11.31	13.05	12.81	94.51
50	William Crosby	43.08	10.71	13.46	10.25	12.90	90.40
†	John Gibson	69.23	10.00	10.77	9.54	14.16	113.70
¶	Louis H. Barnard	33.08	20.18	30.42	13.89	14.30	111.87
†	Harry L. Sturdevant	60.77	7.50	15.35	7.16	10.65	101.43
†	John A. Bell	52.31	8.21	19.12	6.88	10.89	97.41
†	Daniel P. Menefee	29.23	18.93	20.73	13.61	13.38	95.88
†	Joseph Beale	30.77	13.57	27.73	10.95	11.75	94.77
†	Percival L. Drayton	23.08	11.07	19.92	22.60	11.03	87.70
†	Oliver H. P. Belmont	25.38	13.57	10.23	23.44	10.82	83.45
†	Franklin Swift	33.08	14.29	9.15	9.54	13.56	79.62
†	John A. Dougherty	35.38	9.64	8.62	8.28	13.95	75.87
§	Samuel Richardson	36.92	8.57	12.38	6.46	11.54	75.87
§	Edwin H. Tillman	38.46	7.86	8.08	6.46	13.80	74.66
§	William J. Maxwell	25.38	8.93	12.92	9.54	12.36	69.13
§	Busbrod W. Taylor	27.69	9.29	9.69	7.44	12.69	66.80
†	Kantaro Arima	(a)	(a)	(a)	(a)	(a)	(a)
‖	William L. Rodgers	56.15	23.75	34.79	14.88	12.93	141.90

‖ Absent, (sick,) during annual examination, examined in September.

CADET-MIDSHIPMEN.

Fourth class (94 *members*), *deficient sections.*

The following Cadets, having been turned back at the semi-annual examination, have no relative position with the members of the fourth class.

† Henry E. Baker, jr.	‡ William A. Graham.	‡ Alfred N. Paxton.
§ David L. Bartlett.	§ Alfred G. Gray.	§ William W. Picking.
‡ Howard C. Boon.	‡ James Gray.	‡ George H. R. Preble.
‡ John P. Boyd.	§ Arthur B. Guinnip.	† Maurice L. Read.
§ Charles R. Breck.	‡ Charles W. Jungen.	‡ Joseph L. Redfern.
‡ Ambrose Cramer.	‡ Robert F. Lopez.	‡ Rennie P. Schwerin.
§ LeRoy E. Cummings.	§ Alfred I. Maury.	‡ Edwin B. Webster.
‡ Andrew C. Cunningham.	‡ Frederick P. Meares.	‡ George S. Welsh.
‡ Edward D. Fitzgerald.	‡ Alfred G. Morey.	§ Llewellyn V. Wilson.

CADET-ENGINEERS.

Merit-roll of the first class (16 *members*), *annual examination, June,* 1875, *and general merit-roll for two years.*

Order of general merit.	Name.	Steam.	Electricity.	Chemistry.	Heat.	Applied mathematics.	French.	Conduct.	Aggregate for second year.	Aggregate for first year.	Aggregate for two years.
	Maxima	**198**	**45**	**99**	**45**	**120**	**45**	**150**	**702**	**355**	**1057**
*1	**Frank H. Bailey**	198.00	40.71	89.57	43.00	120.00	15.00	150.00	656.28	310.47	966.75
*2	**William Cowles**	189.20	42.86	80.14	33.00	112.00	22.00	148.20	627.40	298.35	925.75
*3	**George S. Willitts**	180.40	33.21	70.71	29.00	112.00	37.00	149.85	612.17	298.97	911.14
*4	**William L. Catheart**	171.60	36.43	84.86	37.00	88.00	39.00	146.85	603.74	285.21	888.95
*5	**Walter F. Worthington**	132.00	23.57	99.00	31.00	72.00	43.00	149.85	550.42	250.68	801.10
6	William N. Little, jr	154.00	38.57	61.29	25.00	66.67	25.00	139.35	509.88	276.15	786.03
7	Edgar T. Warburton	132.00	30.00	94.29	45.00	98.67	30.00	149.55	579.51	186.42	765.93
8	Theodore F. Burgdorff	118.80	45.00	42.43	39.00	82.67	35.00	142.80	505.70	241.42	747.12
9	William R. King	74.80	20.36	28.29	27.00	104.00	22.00	138.00	414.45	313.95	728.40
10	Edward R. Freeman	101.20	25.71	47.14	35.00	56.00	33.00	143.10	441.15	261.80	702.95
11	George H. T. Babbitt	110.00	27.86	54.21	21.00	93.33	30.00	137.10	473.50	179.38	652.88
12	Frank H Eldridge	162.80	33.21	54.21	23.00	50.67	17.00	149.55	490.44	162.28	652.72
13	Charles Kleckner	83.60	17.14	66.00	41.00	61.33	19.00	141.30	429.37	211.02	640.39
14	Alberto De Ruiz	66.00	15.00	33.00	15.00	42.67	45.00	131.10	347.77	254.78	602.55
15	Edmund U. Loomis	92.40	20.36	37.71	17.00	77.33	27.00	143.70	415.50	185.21	600.71
†	William B. Bogga	145.20	12.86	75.43	19.00	42.67	41.00	141.75	477.91	245.95	723.86

CADET-ENGINEERS.

Merit-roll of the second class (3 *members*), *annual examination, June,* 1875.

Order of annual merit.	Name.	Mathematics.	Steam.	French.	Conduct.	Aggregate.
	Maxima	**150**	**99**	**51**	**55**	**355**
1	William B. Dunning	150.00	99.00	34.00	52.47	335.47
2	Robert L. Reid	100.00	66.00	51.00	51.43	268.43
3	Henry H. Stivers	50.00	33.00	17.00	53.30	153.30

CADET-ENGINEERS.

Merit-roll of the fourth class (26 *members*), *annual examination, June*, 1875.

Order of annual merit.	Name.	Mathematics.	Grammar.	History and composition.	French.	Conduct.	Aggregate.
	Maxima	120	30	42	24	15	231
*1	Ira N. Hollis	120.00	30.00	42.00	24.00	14.49	230.49
*2	Franklin J. Schell	115.79	26.82	36.40	18.11	14.91	212.03
*3	Goold H. Bull	111.58	22.73	33.60	20.63	13.28	201.82
*4	Frank W. Bartlett	98.95	26.82	35.00	22.32	13.31	196.40
*5	Harry W. Spangler	107.37	28.18	28.00	15.58	14.16	193.29
6	Howard Gagé	94.74	25.00	40.60	16.42	14.39	191.15
7	George W. McElroy	103.16	21.82	30.80	13.89	12.96	182.63
8	Joseph R. Wilmer	65.26	29.09	32.20	23.16	14.45	164.16
9	Robert S. Griffin	90.53	20.00	18.20	19.79	14.36	162.88
10	Charles L. Wight	69.47	20.91	37.80	18.95	14.88	162.01
11	Frederick C. Bieg	73.68	18.18	29.40	21.47	14.54	157.27
12	Mortimer E. Cooley	86.32	19.09	19.60	17.26	14.03	156.30
13	John L. Gow	82.11	25.00	21.00	8.84	13.98	150.93
14	Henry K. Ivers	56.84	23.64	39.20	11.37	14.87	145.92
15	Joseph McC. Pickrell	77.89	13.64	24.50	14.74	13.43	144.20
16	Horace G. Dungan	52.63	11.36	15.40	13.05	14.43	106.87
17	George E. Burd	40.00	17.27	14.00	8.00	14.16	93.43
†	Frank M. Bennett	46.32	15.91	26.60	4.63	13.49	106.95
†	Thomas J. Hogan	35.79	15.91	22.40	10.53	14.22	98.85
†	George R. Salisbury	61.05	8.18	8.40	2.95	14.85	95.43
†	Edward H. Scribner	46.32	9.09	9.80	12.21	14.84	92.26
†	Harold P. Norton	31.58	10.00	24.50	5.47	14.96	86.51
†	Harry S Elseffer	23.16	11.36	16.80	7.16	12.99	71.47
†	Henry F. Harrison	14.74	12.73	12.60	9.68	14.40	64.15
†	John U. Crygier	18.95	14.55	11.20	6.32	13.05	64.07
†	Henry O'Connor	27.37	7.27	7.00	3.79	13.97	59.40

† Allowed to enter the next fourth class on condition of passing at the competitive examination in September.

REGULATIONS

GOVERNING

THE ADMISSION OF CANDIDATES INTO THE NAVAL ACADEMY AS CADET-MIDSHIPMEN.

NOMINATION.

I. The number of Cadet-Midshipmen allowed at the Academy is one for every Member and Delegate of the House of Representatives; one for the District of Columbia; and ten appointed annually at large.

II. The nomination of candidates for admission from the District of Columbia and at large is made by the President. The nomination of a candidate from any congressional district or Territory is made on the recommendation of the Member or Delegate from actual residents of his district or Territory.

III. Each year, as soon after the 5th of March as possible, Members and Delegates will be notified in writing of vacancies that may exist in their districts. If such Members or Delegates neglect to recommend candidates by the 1st of July in that year, the Secretary of the Navy is required by law to fill the vacancies existing in districts actually represented in Congress.

IV. The nomination of candidates is made annually between the 5th of March and the 1st of July. Candidates who are nominated in time to enable them to reach the Academy on the 21st of June will receive permission to present themselves at that time to the Superintendent of the Naval Academy, for examination as to their qualifications for admission. Those who are nominated prior to July 1, but not in time to attend the June examination, will be examined on the 12th of September following; and should any candidate fail to report, or be found physically or mentally disqualified for admission in June, the Member or Delegate from whose district he was nominated will be notified to recommend another candidate, who shall be examined on the 12th of September following. When any of the dates assigned for examinations fall on Sunday, the examination will take place on the following Monday.

V. A sound body and healthy constitution, good mental abilities, a natural aptitude for study and habits of application, persistent effort, an obedient and orderly disposition, and correct moral principles and deportment, are so necessary to success in pursuing the course at the Academy, that persons conscious of any deficiency in these respects are earnestly recommended not to subject themselves or their friends to the mortification and disappointment consequent upon failure, by accepting nominations and attempting to enter a service for which they are not fitted.

EXAMINATION.

VI. Each candidate for appointment as Cadet-Midshipman must present to the Academic Board satisfactory testimonials of good moral character, and must certify *on honor* to his precise age, which must be over fourteen and less than eighteen years, at the time of the examination. No candidate will be examined whose age does not fall within the prescribed limits.

VII. Candidates must be physically sound, well formed, and of robust constitution; they will be required to pass a satisfactory examination before a medical board com-

posed of the surgeon of the Naval Academy, and two other medical officers to be designated by the Secretary of the Navy.

VIII. Any *one* of the following conditions will be sufficient to cause the rejection of a candidate:—

Feeble constitution, inherited or acquired;

Greatly-retarded development;

Permanently-impaired general health;

Decided cachexia, diathesis, or predisposition;

All chronic diseases or results of injuries that would permanently impair efficiency, viz:—

Weak or disordered intellect;

Cutaneous and communicable diseases;

Unnatural curvature of spine, torticollis, or other deformity;

Permanent inefficiency of either of the extremities or articulations from any cause;

Epilepsy or other convulsions within five years;

Impaired vision, or chronic disease of the organs of vision;

Great hardness of hearing, or chronic disease of the ears;

Chronic nasal catarrh, ozæna, polypi, or great enlargement of the tonsils;

Impediment of speech to such an extent as to impair efficiency in the performance of duty;

Decided indications of liability to pulmonary disease;

Chronic cardiac affections;

Hernia or retention of testes in inguinal cavity;

Sarcocele, hydrocele, stricture, fistula, or hæmorrhoids;

Large varicose veins of lower limbs, scrotum, or cord;

Chronic ulcers.

Attention will also be paid to the stature of the candidate; and no one *manifestly* under size for his age will be received into the Academy. In case of doubt about the physical condition of the candidate, any marked deviation from the usual standard of height will add materially to the consideration for rejection. Five feet will be the minimum height for the candidate.

The board will exercise a proper discretion in the application of the above conditions to each case, rejecting no candidate who is likely to be efficient in the service, and admitting no one who is likely to prove physically inefficient. No candidate rejected by the board will be allowed a re-examination.

IX. The candidates must pass a satisfactory examination before the Academic Board in reading, writing, spelling, arithmetic, geography, and English grammar.

X. All the examinations, except in reading, will be written. Candidates who fall below the standard will receive a second and final examination in the subjects in which they fail. Deficiency in any one of the subjects at the second examination will be sufficient to insure rejection.

XI. "Candidates rejected at such examinations shall not have the privilege of another examination for admission to the same class unless recommended by the Board of Examiners."—[*Rev. Stat.*, § 1515.]

GENERAL CHARACTER OF QUESTIONS.

XII. ARITHMETIC.—*Notation and numeration.*—The candidate is required to express in figures any whole number, decimal, or mixed number; to write in words any given number; and to explain the Roman and Arabic systems of notation.

Denominate numbers.—The tables of money, weights, and measures in common use, including English money; addition, subtraction, multiplication, and division of denominate numbers; the relation existing between the troy and avoirdupois pound; number of cubic inches in a gallon; reduction of differences of longitude to their equivalents in time, and *vice versa*.

Fractions.—The candidate must be familiar with all the processes of common and

Addenda to Article XII.

Percentage, Interest, and Discount.—Examples usually given under these heads arithmetics.

Mensuration.—The measurement of rectangular surfaces and volumes.

Evolution.—The extraction of square and cube roots.

decimal fractions, and is expected to be able to give clearly the reasons for such processes, and to be familiar with the contracted methods of multiplication and division given in the ordinary text-books on arithmetic.

Properties of numbers.—Test of divisibility of numbers by 2, 3, 5, 8, 9, 11, 25, 125, &c.; the resolution of composite numbers into prime factors; the method of determining whether any number is prime or composite, and of finding the greatest common divisor and the least common multiple of large as well as small numbers.

Ratio and proportion.—Definitions and explanations of the nature of ratio and proportion; different methods of writing a proportion; solution of problems in simple and compound proportion.

Analysis.—Miscellaneous problems usually classed under this head, similar to those found in school-arithmetics. It is essential that the candidate shall be thoroughly proficient in all branches of arithmetic; unusual excellence in this will be allowed to count in his favor in case of a slight deficiency in other subjects.

Should persons intending to present themselves as candidates acquire a knowledge of algebra, it will be found to be of material assistance in the course of study pursued at the Academy, although not required for admission.

When practicable, should the candidate so prefer, algebraic solutions of problems may be substituted for arithmetical solutions.

GEOGRAPHY.—Candidates will be questioned on the grand divisions of the land and water; the character of coast-lines; the direction and position of mountain-chains and the locality of important peaks; the position and course of rivers, their tributaries, and the bodies of water into which they empty; the position of important seas, bays, gulfs, and arms of the sea; the political divisions of the land, their position, boundaries, and capital cities; the position and direction of great peninsulas, and the situation of important and prominent capes; straits, sounds, channels, and the most important canals; great lakes and inland seas; position and political connection of important islands and colonial possessions; locality of cities of historical, political, or commercial importance, (attention is specially called to the rivers and bodies of water on which cities are situated); the course of a vessel in making a voyage between well-known sea-ports.

GRAMMAR.—Candidates will be examined in the whole of English grammar as treated in the common-school text-books, embracing the following subjects: The divisions of letters, and the use of capitals; the parts of speech; the classification of *nouns*, and the distinctions of person, gender, and number; under *number*, the rules for the formation of the plural, nouns irregular and defective in number, the plural of proper names; under *case*, the different uses of the three cases, the rules for inflection, the changes in ending to denote case; the difference between the definite and indefinite *article*, and the use of *a* or *an;* the classification of *adjectives;* the explanation of the different degrees of comparison; the rules for comparing adjectives; irregular and defective comparison; numerals and their classification; the double classification of *pronouns*, first, into substantives and adjectives, secondly, into personals, relatives, &c.; peculiarities in the use of personal pronouns, as, the difference between *my* and *mine*, between *thou* and *you*, and the various uses of *it;* compound personal pronouns; the double office of relatives, and the different classes of objects to which each of them is applied; compound relative pronouns; interrogative pronouns; adjective pronouns, or pronominal adjectives, and their classification; the classification and conjugation of *verbs;* the relations between transitive and intransitive verbs; the principal parts of regular, irregular, and defective verbs; the uses and inflexion of auxiliaries; the essential peculiarities in the use of voice, mood, tense, number, and person; tense-endings and personal endings; impersonal verbs; the classification, formation, and comparison of *adverbs;* conjunctive adverbs; the use of *prepositions*, *interjections*, and *conjunctions*, with the classification of the latter.

The rules for the construction and arrangement of words and sentences, given under syntax.

Parsing, according to the following model:

Noun: Class, gender, number, person, case.

Article: Definite or indefinite; qualified noun.

Adjective: Class; compared or not compared; comparison, if admitting it; degree of comparison; qualified noun.

Personal pronoun: Person, gender, number, case.

Relative pronoun: Person, gender, number, case, antecedent.

Interrogative pronoun: Gender, number, case.

Adjective pronoun (or pronominal adjective): Class; qualified word.

Verb: Class, form, principal parts, tense, mood, voice, person, number, subject.

Adverb: Class; derivation and comparison, if derived and compared; qualified word.

Preposition: Words between which the relation is shown by the preposition.

Interjection: The kind of emotion expressed.

Conjunction: Class; words or sentences connected.

The construction of the word will be required in all cases.

READING.—Candidates will be examined in reading aloud English prose, in a standard work; for example, Bancroft's History of the United States.

WRITING AND SPELLING.—Candidates will be required to write a short original letter, and an exercise in dictation, and to spell twenty-four words in common use.

An exercise containing eight or more mistakes in spelling will not be considered satisfactory, and will be sufficient of itself to cause the rejection of the candidate.

ADMISSION.

XIII. Candidates who pass the physical and mental examinations will receive appointments as Cadet-Midshipmen, and become inmates of the Academy. Each cadet will be required to sign articles by which he binds himself to serve in the United States Navy eight years (including his time of probation at the Naval Academy), unless sooner discharged. The pay of a Cadet-Midshipman is $500 a year, commencing at the date of his admission.

XIV. Cadets immediately after their admission will supply themselves with the following articles, viz:

One parade-suit	$37 72	One hair-mattress	$10 71
One undress-suit	15 79	One straw-mattress	1 58
One working-suit	3 63	One hair-pillow	1 58
One overcoat	22 80	One pair blankets	4 12
One rubber-coat	5 52	Two bed-spreads	2 84
One parade-cap	3 95	Six sheets	5 25
One undress-cap	1 75	Four pillow-cases	1 24
*Two pairs high shoes	12 50	*One tooth-brush	25
One pair gymnastic slippers	1 22	*One hair-brush	80
*Eight white shirts	16 00	*One whisk	30
*Two night-shirts	3 00	*One coarse comb	34
*Four under-shirts	2 52	*One fine comb	30
Twelve linen collars	1 80	One mug	13
*Eight pairs socks	2 00	*One cake soap	10
*Four pairs drawers	3 00	One soap-dish	14
*Six handkerchiefs	2 04	One requisition-book	44
*Eight towels	2 00	One laundry-book	48
Two pairs drill-gloves	1 32	One pass-book	47
Two pairs Lisle-thread gloves	72	One stencil and ink	23
*One pair suspenders	46	*One thread and needle case	53
One silk handkerchief	77	One rug	1 86
One neck-tie	84	One wash-basin	1 36
Two clothes-bags	70		

Room-mates will procure for their common use—

One looking-glass (half-cost)	$0 75	One broom (half-cost)	$0 20
One water-pail (half-cost)	53	One table-cover (half-cost)	75
One slop-bucket (half-cost)	66		
Total			179 99

The articles marked *, not being required to conform to a standard pattern, may be brought by the cadet from home, but all other articles must conform to the regulations, and must therefore be supplied by the store-keeper.

X. Each Cadet-Midshipman must, on admission, deposit with the paymaster the sum of $50, for which he will be credited on the books of that officer, to be expended, by direction of the Superintendent, in the purchase of text-books and other authorized articles besides those enumerated in the preceding article.

All the deposits for clothing and the entrance-deposit of fifty dollars must be made before a candidate can be received into the Academy.

SUMMARY OF EXPENSES.

Deposit for clothing	$179 99
Deposit for books, &c	50 00
Total deposit required	229 99

The value of clothing brought from home is to be deducted from this amount.

Each Cadet-Midshipman, *one month after admission*, will be credited with the amount of his actual expenses in traveling from his home to the Academy.

XV. A Cadet-Midshipman who voluntarily resigns his appointment within a year of the time of his admission to the Academy will be required to refund the amount paid him for traveling-expenses.

GEO. M. ROBESON,
Secretary of the Navy

EXAMINATION OF CANDIDATES FOR ADMISSION AS CADET-MIDSHIPMEN JUNE, 1875.

ARITHMETIC.

JUNE 23, 1875.—*Time allowed, four hours.*

1. Divide 573.24 by 1,000,000; divide 0.1 by 100; divide 100 by 0.0001; divide 1.0665 by 0.00135. Reduce $\frac{11}{16000}$ to a decimal. Find what decimal part 0.00135 is of 1.0665.

2. Simplify $\frac{1.18}{.152} \times \frac{3.64}{2.95}$. Add $\frac{2}{3}$ of $\frac{3}{7}$ to $\frac{3}{7}$ of $2\frac{1}{3}$, and multiply the result by $\frac{\frac{2}{3} \text{ of } \frac{5}{6}}{\frac{5}{4} + \frac{4}{5}}$.

Multiply together $\frac{3}{5}$, $\frac{4}{11}$, $\frac{19}{21}$, $\frac{77}{33}$, $\frac{423}{1477}$, $\frac{91}{4}$, $\frac{231}{119}$, and $\frac{493}{1015}$.

3. Divide $(2 + \frac{1}{3} + \frac{1}{5} + 1\frac{1}{12} + \frac{1}{15} + \frac{1}{18})$ by $(1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5})$. Divide the greatest of the fractions $\frac{1}{2}\frac{1}{7}$ of $2\frac{1}{2}$, $\frac{1}{24}$ of $3\frac{1}{4}$, and $\frac{1}{23}$ of $4\frac{5}{24}$ by the least.

4. What weight is the same fraction of 5 lbs. 8 oz. 4 dwts. 22 grs. that £1 11*s.* 10½*d.* is of £3 10*s.* 1½*d.*? A train travels at the rate of 30 miles an hour; over what distance in feet does it pass in one second?

5. Separate each of the numbers 1156155, 121121, and 13377 into its prime factors. State in general terms which factors must be taken to form the least common multiple, and which to form the greatest common divisor. Find the least common multiple and greatest common divisor of the above three numbers, using the factors already found.

6. Find to five decimal places the sum of the fractions—

$$\frac{1}{1'}\ \frac{1}{1'}\ \frac{1}{2'}\ \frac{1}{2.3'}\ \frac{1}{2.3.4'}\ \frac{1}{2.3.4.5'}\ \frac{1}{2.3.4.5.6'}\ \frac{1}{2.3.4.5.6.7'}\ \frac{1}{2.3.4.5.6.7.8'}$$

and

$$\frac{1}{2.3.4.5.6.7.8.9'}$$

Solve two of the following questions.

7. *A* can perform a piece of work in $2\frac{2}{3}$ days, and *B* can do the same work in $3\frac{1}{3}$ days; how long would it take them to do it working together? and if $7 is paid for the whole work, how should it be divided between them?

8. A man who rows 4 miles in an hour in still water takes an hour and twelve minutes to row that distance up a river; how long does it take him to row down again?

9. A train approaching a station sounds a whistle on passing each of two posts which are placed half a mile apart. The interval between the times at which the sounds are heard at the station is 42.4 seconds. Supposing that sound travels 1100 feet per second, at what rate in miles per hour is the train traveling?

10. *A* can run a mile in 7.68 minutes and *B* can run 7.68 miles per hour; which is the faster runner, and, in a race which the faster wins in six minutes, how far will the loser be behind?

ENGLISH BRANCHES.

JUNE 23, 1875.—*Time allowed, three hours.*

GRAMMAR.

1. Define *comparison, syntax, auxiliary verb, adverb.*
2. Give the possessive plural of *basis, sea, beef, fisherman, talisman.*
3. Inflect (or decline) *thief, mercy, princess, pioneers.*

4. What is the difference in meaning between the auxiliaries *may* and *must*?
5. Compare *nigh, happy, fit, old.*
6. Give the principal parts of *cost, lead, read, sweep, lay.*
7. Parse the words in italics:

Hear my decree;
This *day* have I *begot whom* I declare
My *only* son; your *head* I him appoint.

8. Correct the following sentences:

You and me are going on board ship, ain't we?
It rains most every day.

SPELLING.

Generous.	Instigate.	Academy.	Irksome.
Progeny.	Derisive.	Mariner.	Extension.
Essential.	Discipline.	Strategy.	Obsolete.
Symptom.	Agreeable.	Contagious.	Usually.
Inveigle.	Illuminate.	Courageous.	Familiar.
Italy.	Eliminate.	Congeal.	Coalesce.

GEOGRAPHY.

1. Bound Bolivia.
2. Where is Gibraltar? Callao? Pernambuco? Singapore? Glasgow?
3. Give the source, direction, and mouth of the Red River; Yellowstone River; Colorado River; Orange River.
4. Where is Mt. Hecla? Vesuvius? Cotopaxi? Etna?
5. Make a coasting-voyage from St. Petersburg to Barcelona, touching at three seaports of France. Name in order the countries you pass and the waters you sail through.
6. What bodies of land are separated by Torres Strait? Strait of Mackinaw? Strait of Sunda? Strait of Juan de Fuca?

RE-EXAMINATIONS.

ARITHMETIC.

JUNE 24, 1875.—*Time allowed, four hours.*

1. Add together 1.465, .0095, 37.15, 28.456, and 16.1685, and divide the sum by .0296. Divide 625 *ten-millionths* by 125 *thousandths*. What decimal part of 24 hours is 8 hours 46 minutes 19.2 seconds?

2. From $12\frac{3}{4}$ take the sum of $\frac{2}{3}$ of $3\frac{1}{8}$ and $\frac{5}{6}$ of $13\frac{1}{2}$, and divide the result by $2\frac{16}{31}$. What number multiplied by $\frac{2\frac{3}{5}}{4\frac{1}{2}}$ will give 2 for the product? (Express the fractional part of the result decimally.)

3. Change $\frac{5}{7}$ of $1\frac{3}{14}$ of $1\frac{37}{39}$ to an equivalent fraction having 81 for its denominator. What number is that from which, if 9 be subtracted, $\frac{4}{19}$ of the remainder is 16?

4. Find the prime factors of 111540, 42336, and 67392, and thence write down the prime factors of the least number which will contain each of the three given numbers without a remainder.

How may the least common multiple of two given numbers be found when their greatest common divisor is also given?

5. Simplify $\frac{.12 \text{ of } (.0104 - .002) + .36 \text{ of } .002}{.12 \text{ of } .12}$, and express the result as a fraction of .6.

Reduce the fraction $\frac{£20\ 3s.\ 9d.}{£60\ 11s.\ 3d.}$ of $\frac{1 \text{ mile } 880 \text{ yards}}{3 \text{ miles}}$ to its simplest form, and state the denomination of the result.

6. Find to five decimal places the value of the expression—

$$1-\frac{1}{2}+\frac{1}{2.3.4}-\frac{1}{2.3.4.5.6}+\frac{1}{2.3.4.5.6.7.8}-\frac{1}{2.3.4.5.6.7.8.9.10}$$

Solve two of the following questions.

7. A room is 38 feet 8 inches long, 13 feet 6 inches wide, and 10 feet 9 inches high. Find the cost of papering the walls with paper 1 foot 10 inches wide at 12 cents per linear yard, and of carpeting the floor with carpet $\frac{3}{4}$ yard wide at $1.25 per yard.

8. In a boat-race, the *A* crew rowed 39 strokes per minute and the *B* crew 41; but 19 strokes of the former were equivalent to 20 of the latter. The *A* crew rowed over the course of 4 miles in 25 minutes. Find the number of feet and the number of seconds by which the race was won.

9. A person started at half past two, and walked to a village, arriving there when the church-clock indicated a quarter past three; after staying 25 minutes, he drove back by a road one-fourth as long again, at a rate twice as fast as he had walked, and reached home at 4 o'clock. Determine how much the village-clock was wrong.

10. Two clocks were set right at half past seven in the evening of June 1, 1875, and it is found that one gains 7 seconds in 11 hours and the other loses 11 seconds in 14 hours. If their rates continue unaltered, when will they be together again?

ENGLISH BRANCHES.

JUNE 24, 1875.—*Time allowed, three hours.*

GRAMMAR.

1. What adverb corresponds to the adjective *good? pretty? true? wise? noble?*
2. Give the principal parts of *smite, rid, steal, throw.*
3. What part of speech is *as* in each of the following sentences?

   Do as I do.

   As we have finished, we will go.

   Let such as hear, take heed.

4. Give the superlative of *shy;* of *happy;* of *unsuitable.* Give the positive of *elder, less, next.*
5. Decline (or inflect) *dwarf, leaf, city, journey, which.*
6. "*Whom* the *gods* love *die young*" *was said* of yore. Parse the words in italics.
7. Correct: He does like we do.

   That child looks beautifully.

SPELLING.

Vacillate.	Courtesy.	Artillery.	Britain.
Ruffian.	Citizen.	Dissipated.	Collision.
Embarrass.	Jealousy.	Linen.	Separate.
Harass.	Chemistry.	Acquittal.	Maritime.
Polygamy.	Financial.	Icicle.	Infancy.
Literary.	Conscience.	Local.	Speech.

GEOGRAPHY.

1. Name the States of the United States which have no sea-coast, and give the capital of each of them.
2. Locate Cairo (United States), Mazatlan, Bremen, Trieste, Brest.
3. Describe the following rivers: Danube, Cumberland, Tagus, Lena.
4. Give the position of the following, and state to what country each belongs: Malta, Cape Verde Islands, Ceylon, Cyprus.
5. Where are Capes Fear, Mendocino, Blanco, Clear, Guardafui?
6. Give the position of the following mountains: Alleghany, Jura, Altai, Mt. St. Elias.

REGULATIONS

FOR THE

APPOINTMENT OF CADET-ENGINEERS IN THE UNITED STATES NAVY.

I. In pursuance of law, applications will be received by the Navy Department for the appointment of Cadet-Engineers.

II. The application is to be addressed to the Secretary of the Navy, and can be made by the candidate or by any person for him, and his name will be placed on the register. The registry of a name, however, gives no assurance of an appointment, and no preference will be given in the selection to priority of application.

III. The number of appointments which can be made is limited by law to twenty-five each year. The candidate must not be less than sixteen nor more than twenty years of age; he will be required to certify *on honor* to his precise age, to the Academic Board, previous to his examination, and no one will be examined who is over or under the prescribed age. His application must be accompanied by satisfactory evidence of moral character and health, with information regarding date of birth and educational advantages hitherto enjoyed. Candidates who receive permission will present themselves to the Superintendent of the Naval Academy on the 5th of September for examination as to their qualifications for admission.

IV. The course of study will comprise four academic years, with two additional years at sea. All cadets who finally graduate will be commissioned Assistant Engineers in the Navy as vacancies occur. The pay of a Cadet-Engineer is the same as that of a Cadet-Midshipman, $500 per annum, and at sea the same as Midshipmen.

V. The academic examination previous to appointment will be competitive and will be on the following subjects, namely: Arithmetic; algebra, through equations of the first degree; plane geometry; rudimentary natural philosophy; reading; writing; spelling; English grammar; English composition; and geography. The candidate will also be required to exhibit a fair degree of proficiency in pencil-sketching, and to produce satisfactory evidence of mechanical aptitude. Candidates who possess the greatest skill and experience in the practical knowledge of machinery, *other qualifications being equal*, shall have precedence for admission.

The other requisites and conditions are the same as those of Cadet-Midshipmen.

COMPETITIVE EXAMINATION OF CANDIDATES FOR APPOINTMENT AS CADET-ENGINEERS, SEPTEMBER, 1875.

ARITHMETIC.

Time allowed, three hours.

1. Find the *sum*, *difference*, *product*, and *two quotients* of 30.33 and .0337, and find the sum of all the results. Take $\frac{4}{33}$ of £4 10*s.* 9*d.* from $\frac{2}{39}$ of £6 6*s.* 9*d.*

2. Reduce 3 qts. 1 pt. $2\frac{2}{9}$ gills to the fraction of 5 galls. 2 qts. 1 pt. If $25\frac{1}{4}$ francs be equal to £1, what fraction of a shilling is 1 franc?

3. To the continued product of $6\frac{1}{2}$, $7\frac{2}{3}$, and $8\frac{3}{4}$, add $\frac{3\frac{5}{8}}{4\frac{4}{9}}$, and divide the sum by $\frac{4\frac{6}{5}}{10\frac{5}{6}}$ of $12\frac{2}{3}$. Reduce the fraction $\frac{3 \text{ lbs. } 3 \text{ oz. } 5 \text{ dwts.}}{8 \text{ lbs. } 5 \text{ oz. } 8 \text{ dwts.}}$ to its simplest form.

4. Find the square root of 278.035 and the cube root of 356.88, each to three decimal places.

5. The interest on £250 for 73 days amounts to £18 15*s.*; find the rate of interest per annum. The interest on a certain sum of money for 2 years is \$344.79, and the discount on the same sum for the same time is \$306.48, simple interest being reckoned in both cases; find the rate per cent. per annum and the sum.

6. *A* and *B* are two railway companies that pay respectively $4\frac{1}{2}$ per cent. and $1\frac{5}{8}$ per cent. per annum on their \$100 shares. When the price of a share in *A* is $101\frac{1}{4}$ and in *B* is $32\frac{1}{4}$, in which company is it most advantageous to invest? and what is the difference of income that would arise from an investment of \$17415. in one rather than in the other?

ALGEBRA.

Time allowed, two and a half hours.

1. Simplify the expression—

$$2a-(3b+c-2d)-\{(2a-3b)+(c-2d)\}+\{2a-(3b+c)-2d\}-\{(2a-3b+c)-2d\}.$$

Multiply $x^{\frac{1}{2}}+x^{-\frac{1}{2}}$ by $x^{\frac{1}{2}}-1+x^{-\frac{1}{2}}$.

Divide $a^{\frac{n+1}{n}}+b(ab^{\frac{1-n}{n}}+a^{\frac{1}{n}})+b^{\frac{n+1}{n}}$ by $a+b$.

2. Simplify the expression—

$$3a-\left[b+\{2a-(b-a)\}\right]+\tfrac{1}{2}+\frac{2c^2-\frac{1}{2}}{2c+1}$$

Find the value of $\dfrac{x-a}{b}-\dfrac{x-b}{a}$ when $x=\dfrac{a^2}{a-b}$.

Separate $4a^2b^2-(a^2+b^2-c^2)^2$ into four factors.

3. Simplify $\dfrac{m^2-n^2}{m^3+n^3}$ of $\dfrac{\dfrac{m^2+n^2}{n}-m}{\dfrac{n}{1}-\dfrac{1}{m}}$.

Find the value of $\dfrac{x+y-1}{x-y+1}$ when $x=\dfrac{ab+a}{ab+1}$, $y=\dfrac{a+1}{ab+1}$.

4. Solve the equations—

$$\frac{3x-1}{5}-\frac{13-x}{2}=\frac{7x}{3}-\frac{11(x+3)}{6}$$

$$\frac{ax^2+bx+c}{px^2+qx+r}=\frac{ax+b}{px+q},$$

$$\frac{mx-a-b}{nx-c-d}=\frac{mx-a-c}{nx-b-d}$$

5. Two persons, *A* and *B*, can perform a piece of work in *a* days; they work together for *b* days, when, *A* being called off, *B* is left to finish it, which he does in *c* days more. In what time could each do it separately?

GEOMETRY.

Time allowed, two hours.

1. Define *plane surface, right angle, perpendicular*. Prove that when two straight lines intersect, the opposite or vertical angles are equal, and that the two straight lines which bisect the two pairs of vertical angles are perpendicular to each other. Define *polygon*. Give the names of as many polygons as you can, stating the number of sides of each.

2. Prove that the sum of all the exterior angles of any polygon is four right angles. Define *rhombus, rhomboid, trapezoid, trapezium*. Draw a diagram of each.

3. Prove that the three perpendiculars erected at the middle points of the sides of a triangle meet in a point.

4. Prove that an inscribed angle is measured by one-half its intercepted arc.

5. In a right triangle *ABC*, right-angled at *C*, *D* is the middle point of *BC*, and *E* the middle point of *AC*. *BE* and *AD* are drawn intersecting at *O*. Find the length of *OC*, denoting the side *AC* by *a* and *BC* by *b*.

ENGLISH GRAMMAR.

I. Define (1) *auxiliary*, (2) *impersonal verb*, (3) *comparative degree*, (4) *subjunctive mood*.

II. Give the principal parts [all forms] of (1) *befall*, (2) *drown*, (3) *sink*, (4) *burst*, (5) *lie* [meaning to recline], (6) *set*.

III. What part of speech is *but* in each of the following sentences?

1. You need not go, but I will.
2. I tell you, but one of us can go.
3. None but the brave deserves the fair.

IV. Decline [or inflect] *cannon, clothes, goose, grotto, alkali*.

V. Give the possessive, singular and plural, of *grief, sheaf, talisman*.

VI. Parse the words in italics in the following passage:—

A *still*, small voice *spake* unto me:
"Thou *art so full* of misery,
Were it not better not *to be*?"

GEOGRAPHY.

1. Fix the position of Milwaukee, Memphis, Liverpool, Belgrade, stating on what body of water each is situated.

2. Where is Mont Blanc? Mt. Hecla? Mt. Sinai? Mt. St. Elias?

3. Make a voyage from Duluth to Albany. Name in order the States you pass on your right hand and the waters you pass through.

4. Where is Herzegovina? Muscat? Jerusalem? Leghorn?

5. Fix the position of the following arms of the sea, telling what country each indents, and of what water it is a branch:

1. Chaleurs Bay. 2. Gulf of Tonquin. 3. Delagoa Bay. 4. Sea of Azov.

SPELLING.

Correspond.	Antithesis.	Countersign.	Fabricate.
Taciturn.	Brevity.	Criterion.	Artifice.
Euphony.	Christen.	Indelible.	Discipline.
Elegant.	Epithet.	Essential.	Solemn.
Barbarous.	Represent.	Symbol.	Impugn.
Florid.	Cancellation.	Perjury.	Placard.

Candidates are required to write a short original letter and an exercise in dictation.

Time allowed in English branches, three hours.

NATURAL PHILOSOPHY.

Time allowed, three hours.

1. Define *centre of gravity*. How could you find the centre of gravity of a board of uniform thickness, cut in the form of a trapezium?

2. Define *specific gravity*. What is taken as the standard for solids and liquids?

EXAMPLE.—(1) A substance weighing 310 grains weighs 188.5 in water; required its sp. gr. (2) Determine sp. gr. of wood from:—weight of wood, 25.35; weight of sinker under water, 9.77; weight of wood with sinker under water, 5.10 grammes.

3. What is the effect of *gravity* upon the *velocity* of a falling body? A body influenced by gravity falls meeting with no resistance; what will be its velocity at the end of one second from rest? Through what *space* will it have fallen at the end of one second?

4. Define *mass of a body; momentum*.

5. Give the *three laws of motion*. Illustrate.

6. State upon what principle the *hydrostatic press* is based. Draw a diagram, and explain how a great pressure can be obtained.

7. Explain the principle of the *siphon*. Is there necessarily a limit to the height of the bend from the level of the liquid being drawn off?

8. What is shown by the *barometer?* Why is mercury more generally used for barometers than other liquids?

9. A rod without weight, eighteen inches in length, has weights at each end, of 2 pounds and 10 pounds respectively; at what point must the rod be supported in order that the weights may balance?

10. What are the temperatures on the *centigrade scale* corresponding to the following temperatures, Fahrenheit: 100°, 0°, -40°?

COURSE OF INSTRUCTION FOR CADET-MIDSHIPMEN.

DEPARTMENT OF SEAMANSHIP.

SEAMANSHIP.—Description of all kinds of rope, and its practical manipulation for all purposes on shipboard; measuring for and fitting standing and running rigging; masting, sparring, and rigging ship; getting on board and stowing a vessel's outfit; organizing a ship's company; fittings of boats; management of boats under all circumstances; evolutions of vessels at sea and in harbor; repair of spars and rigging in cases of accident; duties of officers at sea and in port; rules of the road; wind and weather.

Text-book.—Luce's Seamanship, with lectures, and illustrations from models.

NAVAL ARCHITECTURE AND SHIP-BUILDING.

Text-books.—Thearle's Naval Architecture, and Wilson's Ship-Building, with lectures illustrated by models and drawings.

NAVAL TACTICS.—Organization, formations, and maneuvering of a fleet, under steam or sail.

Text-books.—Manual of Naval Tactics (Ward); Steam Fleet Tactics (Parker); United States Naval Signal-Book; Manual of Signals (Myer).

PRACTICAL EXERCISES, consisting of—

SEAMANSHIP-DRILLS.—Exercises on shipboard, with sails and spars.

NAVAL TACTICS.—Exercises in boats, under oars and under sails.

SIGNALS.—Exercises in the use of signals according to Myer's Army Signal-Code.

Instruction in boxing, gymnastics, swimming, and dancing is in charge of this department.

DEPARTMENT OF ORDNANCE AND GUNNERY.

PRACTICE AND THEORY OF GUNNERY.—*Practical naval gunnery,* as laid down in the Ordnance and Gunnery Instructions for the United States Navy.

Preparation of gun-iron from crude ore, including the description and use of furnaces. Manufacture of wrought iron, steel, and bronze. Fabrication of guns of all descriptions. Manufacture of gunpowder and fuses, and of all kinds of projectiles and fireworks.

Theory of gunnery.—Motion of projectiles *in vacuo* and in the atmosphere; initial, remaining, and final velocities, and the methods of determining their values; the effects of variations of charge, windage, and weight of projectiles; deviation of projectiles; the several systems of pointing; tangent-sights and determination of their values; penetration and shock of projectiles; and recoil of guns.

Text-books.—Cooke's Naval Ordnance and Gunnery; Ordnance Instructions, United States Navy; Gunnery Instructions, United States Navy.

INFANTRY-TACTICS.—Organization and formation of squad, company, and battalion; school of the soldier; company and battalion drill, including instructions for skirmishers and the bayonet-exercise.

Text-book.—United States Infantry Tactics.

PRACTICAL EXERCISES, consisting of—

INFANTRY-DRILL.

FIELD-ARTILLERY AND BOAT-HOWITZER EXERCISE.

GREAT GUNS.—Exercises and target-practice on board the United States ship Santee.

MORTAR-PRACTICE.

FENCING.—Exercise with small-swords and broad-swords.

DEPARTMENT OF MATHEMATICS.

ALGEBRA.—Fundamental operations; reduction and solution of equations of the first and second degrees; reduction and transformation of surd quantities; proportions and progressions; summation of series; nature and construction of logarithms; and the theory of equations.

GEOMETRY.—Plane and solid.

TRIGONOMETRY.—Analytical investigation of trigonometrical formulas, and their application to the solution of all the cases of plane and spherical trigonometry; the construction and use of trigonometrical tables.

APPLICATION OF ALGEBRA AND TRIGONOMETRY.—Mensuration of planes and solids.

DESCRIPTIVE GEOMETRY.—The graphic illustration and solution of problems in solid geometry, and the applications of this method, particularly to the projections of the sphere.

ANALYTICAL GEOMETRY.—Equations of the right line, plane, and conic sections; discussion of general equations of the second degree, involving two or three variables; determination of loci; principal problems relating to the cylinder, cone, sphere, and spheroids.

Text-books.—Ray's Higher Algebra; Chauvenet's Geometry; Chauvenet's Trigonometry; Church's Descriptive Geometry; Todhunter's Conic Sections; Bowditch's Useful Tables.

ELECTIVE COURSES.

In addition to the above, cadets of the third and fourth classes who display marked ability in mathematics are permitted to take an advanced course. The following are the elective courses for 1875–76:

Fourth class.—Todhunter's Algebra and Theory of Equations, and curve-tracing.

Third class.—The elements of the differential calculus, with applications to trigonometry and geometry of two dimensions.

DEPARTMENT OF STEAM-ENGINERY.

MARINE ENGINES.—The classification of marine steam-engines, with their varieties of arrangement. The study of details, and of the instruments and apparatus used in marine service in connection with steam-engines. The varieties of valve-gear, of steam-generators, of propelling-instruments, condensers, distillers, and pumps. The principles followed to insure strength in construction.

PRACTICAL EXERCISES.—The management of engines and boilers in operation. The care, preservation, and adjustment of marine engines. The use of fuel. The use of the indicator and the interpretation of indicator-diagrams. Methods of computing the power and the evaporation, and of determining the incidental losses incurred at sea, which affect the power. The duties of the engine-room watch. The arrangement and disposition of the engineer-force on shipboard.

Text-books.—Bourne's Catechism of the Steam-Engine; King's Practical Notes on the Steam-Engine.

DEPARTMENT OF ASTRONOMY, NAVIGATION, AND SURVEYING.

ASTRONOMY.—Descriptive and practical astronomy, including the use of instruments, especially those used for determining terrestrial latitudes and longitudes.

Text-book.—C. J. White's Astronomy.

NAVIGATION.—Theory and practice of navigation, the latter including instruction in the duties of the navigator, the use of navigating-instruments, and their construction, with the solution of problems and the use of tables.

Text-book.—Coffin's Navigation.

SURVEYING.—The form of the earth, with special reference to the construction of charts; explanation of geodetical surveys; the solution of problems in nautical surveying; and practical work in surveying and constructing charts.

Text-book.—Jeffers's Marine Surveying.

DEPARTMENT OF PHYSICS AND CHEMISTRY.

THE DIFFERENTIAL AND INTEGRAL CALCULUS.—The principles of the differential calculus, including Taylor's theorem, applications to problems of maxima and minima, and the tracing of curves; the methods of integration, and the application of the integral calculus to areas, surfaces, and volumes, and to the finding of centres of gravity and moments of inertia, and to the simpler cases of differential equations.

MECHANICS.—*Statics*, including the theory of friction, adhesion, and stiffness of cordage. *Dynamics*, including the motion of projectiles in a non-resisting medium and in air; motions of translation and of rotation of bodies about an axis; falling bodies; central forces; the simple and the compound pendulum; the laws of planetary motion; work, and conservation of energy.

HYDROSTATICS.—Mechanical properties of fluids; the laws of equilibrium and pressure; the flotation of bodies; the stability and oscillations of floating bodies; specific gravity; the motion of liquids. *Aëriform fluids.*—Laws of pressure; weight and pressure of the atmosphere; density and temperature; the barometer, the siphon, and the pump.

ACOUSTICS.—Theory of waves; the production and propagation of sound; the numerical evaluation of sound; modes of vibration; communication of vibrations; analysis of vibrations.

OPTICS.—The propagation, reflection, and refraction of light; lenses, vision, and optical instruments; spectrum-analysis; color; the undulatory theory of light; polarization and double refraction.

ELECTRICITY AND MAGNETISM.—Magnetism; statical electricity; Voltaic electricity; electro-magnetism; electrical measurements; applications of electricity; thermo-electricity.

CHEMISTRY.—General chemistry.

METEOROLOGY AND CLIMATOLOGY.

EXPERIMENTAL LECTURES IN PHYSICS AND CHEMISTRY.

HEAT.—Theories of heat; sources of heat; conduction, radiation, and convection; specific heat; sensible and insensible caloric; effects of heat; instruments used for the measurement of heat; thermo-dynamics.

Text-books.—Rice and Johnson's Elements of the Differential and Integral Calculus, with lectures; Todhunter's Mechanics for Beginners; Smith's Hydrostatics; Stewart's Elementary Physics; Ganot's Physics (Atkinson's translation); Eliot and Storer's Manual of Chemistry; Eliot and Storer's Chemical Analysis; Maxwell's Theory of Heat; Jenkin's Magnetism and Electricity.

DEPARTMENT OF ENGLISH STUDIES, HISTORY, AND LAW.

LAW.—Constitution of the United States.

International law: origin and growth of the science; rights and duties of nations in peace and war; rights of interference, of jurisdiction over the sea, of commerce, of passage over land and navigable rivers; extradition; duties of ministers, consuls, and naval commanders; confiscation of enemy's property and debts; embargoes; kinds of property liable to capture; domicile; privateering; prizes; *jus postliminii*; rights and duties of neutrals; law of contraband; law of blockade; right of search; ship's papers; truces, passports, and treaties of peace; offenses against the law of nations; piracy; slave-trade.

Outlines of maritime law.

Lectures.

Text-book.—Kent's Commentaries, vol. 1.

HISTORY.—Origin and ethnological grouping of Aryan, Semitic, and Turanian nations; outlines of history, especially the history of Greece and Rome, of the Holy Roman Empire, and of the states of Western Europe down to 1872; historical geography; progress of colonial development in America; history of the United States; naval history; lectures.

Text-books.—Freeman's General Sketch of History, with Mitchell's Ancient Atlas and Johnston's Historical Atlas; Eliot's History of the United States, with Appleton's and Mitchell's Modern Atlases.

Rhetoric and composition.—Essential properties of style; classification of sentences; rules for the construction of sentences; figures of rhetoric; exercises in the composition of themes and official reports.

Text-book.—Bain's Rhetoric.

English.—Historical development of the English language; relation of English to the other Aryan languages; changes wrought by foreign influence on the grammar, vocabulary, and pronunciation of English; progress from the synthetic to the analytic forms of speech; character and course of inflexional development. Etymology; inflexional changes since the conquest. Syntax; analysis of sentences.—Readings from classical authors, with applications of the principles of grammar, and exercises in analysis and in tracing the etymological meaning of words.—Classification of words; definition of words by usage and by derivation; synonyms; force of the common prefixes, affixes, and roots; laws of change in the meaning of words by contraction, extension, and amelioration.—Relation between spoken and written language; faults in diction, and their remedies. Metaphor as the basis of language. Selection and arrangement.—Elementary principles of reasoning; the sources of knowledge and of error; induction and deduction; errors in reasoning.

Text-books.—Tancock's English Grammar and Reading Book; Seeley and Abbott's English Lessons; Hart's Manual of Punctuation.

DEPARTMENT OF MODERN LANGUAGES.

French and Spanish languages.—Grammar; exercises in reading, writing, and conversation.

Text-books.—Fasquelle's French Grammar; Howard's Aid to French Composition; Prud'homme's French Nautical Phrases; Erckmann-Chatrian's Le Conscrit; Roget's Spanish Manual; Tolon's Reader.

DEPARTMENT OF DRAWING.

Right-line drawing; free-hand drawing and perspective; topographical and chart drawing.

The foregoing studies are distributed over four years, and the cadets are arranged in four classes, each class pursuing the course for the year.

PROGRAMME OF STUDIES FOR CADET-MIDSHIPMEN.

The time devoted to daily recitations is divided into three periods, designated thus: (1), (2), (3). (1) denotes first period, from 8.30 a. m. to 10.30 a. m.; (2) denotes second period, from 10.45 a. m. to 12.45 p. m.; and (3) denotes third period, from 2 p. m. to 4 p. m. Practical exercises begin on Saturdays at 10.45 a. m., and on all other days except Sundays at 4 p. m.

First term: September 20, 1875, *to January* 29, 1876.

Department.	Periods.	Subjects.
FOURTH CLASS—FIRST YEAR.		
Mathematics	[M. T. W. Th. F.] (2) [S.] (1)	Algebra and Geometry.
	Once a week	Elective Course.
English Studies, History, and Law	[M. T. W. Th. F.] (1)	English and History.
Modern Languages	1st division, [M. T. Th.] (3)	Fasquelle's Grammar.
	2d division, [M. W. F.] (3)	
Drawing	1st division, [W. F.] (3)	Line-Drawing.
	2d division, [T. Th.] (3)	

First term: September 20, 1875, to January 29, 1876—Continued.

Department.	Periods.	Subjects.
THIRD CLASS—SECOND YEAR.		
Mathematics	[M. T. W. Th. F.] (1)	Trigonometry and Descriptive Geometry.
	Once a week	Elective Course.
	[F.] (3)	Descriptive Geometry.
English Studies, History, and Law	[M. F.] (2) [W.] (3)	History and Rhetoric.
Physics and Chemistry	[T. W. Th.] (2)	Elementary Physics.
Modern Languages	[T. Th.] (3)	Fasquelle's Grammar and French Composition.
Drawing	[M.] (3) [S.] (1)	Sketching.
SECOND CLASS—THIRD YEAR.		
Seamanship	[S.] (1)	Luce's Seamanship.
	[M.] (3) [F.] (2)	Ship-Building.
Ordnance and Gunnery	[Th.] (3)	Infantry-Tactics.
Astronomy, Navigation, and Surveying.	[T.] (3) [W. Th.] (2)	Astronomy.
Physics and Chemistry	[M. T. W. Th. F.] (1)	Applied Mathematics.
English Studies, History, and Law	Once a month	Composition.
Modern Languages	[M. T.] (2) [W. F.] (3)	Nautical Phrase Book and Grammar.
FIRST CLASS—FOURTH YEAR.		
Seamanship	[T. Th.] (3)	Luce's Seamanship.
Ordnance and Gunnery	[T.] (2) [W.] (3)	Ordnance and Armor.
Steam-Engineery	[W. Th.] (2) [F.] (1)	Marine Engines.
Astronomy, Navigation, and Surveying.	[M. T. W. Th.] (1)	Navigation and Surveying.
Physics and Chemistry	[M. F.] (2) [S.] (1)	Light and Heat.
Modern Languages	[M. F.] (3)	Spanish.

Second term: January 31, 1876, to June 20, 1876.

Department.	Periods.	Subjects.
FOURTH CLASS—FIRST YEAR.		
Mathematics	[M. T. W. Th. F.] (2) [S.] (1)	Algebra and Geometry.
	Once a week	Elective Course.
English Studies, History, and Law	[M. T. W. Th. F.] (1)	English and History.
Modern languages	1st division, [M. T. Th.] (3)	Fasquelle's Grammar.
	2d division, [M. W. F.] (3)	
Drawing	1st division, [W. F.] (3)	Topography.
	2d division, [T. Th.] (3)	
THIRD CLASS SECOND YEAR.		
Mathematics	[M. T. W. Th. F.] (1)	Analytical Geometry and Descriptive Geometry.
	Once a week	Elective Course.
	[M.] (3)	Descriptive Geometry.
Physics and Chemistry	[T. Th. F.] (2)	Chemistry.
English Studies, History, and Law	[M. W.] (2) [S.] (1)	History and Rhetoric.
Modern Languages	[T. W. Th. F.] (3)	Fasquelle's Grammar and French Composition.
SECOND CLASS—THIRD YEAR.		
Seamanship	[T. Th.] (3)	Luce's Seamanship.
	[F.] (2)	Naval Tactics.
Ordnance and Gunnery	[T. Th.] (2)	Ordnance-Instructions.
Physics and Chemistry	[M. T. W. Th. F.] (1)	Applied Mathematics and Mechanics.
	[M. W.] (2) [S.] (1)	Electricity.
English Studies, History, and Law	Once a month	Composition.
Modern Languages	[M. W. F.] (3)	Spanish.
FIRST CLASS—FOURTH YEAR.		
Seamanship	[M. W.] (2)	Luce's Seamanship.
	[T. S.] (1)	Naval Architecture.
Ordnance and Gunnery	[M. T. Th.] (3)	Ordnance and Armor.
Steam-Engineery	[W. F.] (3) [Th.] (2)	Marine Engines.
Astronomy, Navigation, and Surveying.	[M. W. Th. F.] (1)	Navigation and Surveying.
English Studies, History, and Law	[T. F.] (2)	Public Law.

COURSE OF INSTRUCTION FOR CADET-ENGINEERS.

First class of 1875–'76.

Differential calculus; integral calculus; mechanics; hydrostatics; descriptive chemistry; analytical chemistry; heat; electricity and electrical measurements; French; steam-engineering (practical and theoretical); mechanical drawing.

Practical exercises in steam-engineering, infantry-tactics, and field-artillery.

The course of instruction for Cadet-Engineers during the first and second years will be the same as for the Cadet-Midshipmen, except the substitution of exercises in steam-engineering for those of the Cadet-Midshipmen in seamanship, great guns, and boat-howitzers.

During the third and fourth years, the Cadet-Engineers will receive an extended course of instruction in mechanics and physical measurements, in the designing and fabrication of machinery, and in the construction and use of marine engines. Seamanship, gunnery, naval and infantry tactics, and navigation will be omitted. In other subjects, the course for the Cadet-Engineers will be the same as for the Cadet-Midshipmen.

Text-books.—Bourne's Hand-Book of the Steam-Engine; Warren's Elements of Mechanical Drawing; Rankine's Steam-Engine and other Prime Movers; Eliot and Storer's Qualitative Chemical Analysis. The other text-books used by the Cadet-Engineers are the same as those used by the Cadet-Midshipmen.

PROGRAMME OF STUDIES FOR CADET-ENGINEERS.

The time devoted to daily recitations is divided into three periods, indicated thus: (1), (2), (3). (1) denotes first period, from 8.30 a. m. to 10.30 a. m.; (2) denotes second period, from 10.45 a. m. to 12.45 p. m.; and (3) denotes third period, from 2 p. m. to 4 p. m.

Practical exercises begin on Saturdays at 10.45 a. m., and on all other days except Sundays at 4 p. m.

First term: September 20, 1875, *to January* 29, 1876.

Department.	Periods.	Subject.
FOURTH CLASS—FIRST YEAR.		
Mathematics	[M. T. W. Th. F.] (2) [S.] (1)	Algebra and Geometry.
	Once a week	Elective Course.
Steam-Enginery	1st division, [W. F.] (3)	Mechanical Drawing.
	2d division, [T. Th.] (3)	
English Studies, History, and Law	[M. T. W. Th. F.] (1)	English and History.
Modern Languages	1st division, [M. T. Th.] (3)	Fasquelle's Grammar.
	2d division, [M. W. F.] (3)	
THIRD CLASS—SECOND YEAR.		
Mathematics	[M. T. W. Th. F.] (1)	Trigonometry and Descriptive Geometry.
	Once a week	Elective Course.
	[F.] (3)	Descriptive Geometry.
Steam-Enginery	[M.] (3) [S.] (1)	Mechanical Drawing.
Physics and Chemistry	[T. W. Th.] (2)	Elementary Physics.
English Studies, History, and Law	[M. F.] (2) [W.] (3)	History and Rhetoric.
Modern Languages	[T. Th.] (3)	Fasquelle's Grammar and French Composition.
SECOND CLASS—THIRD YEAR.		
Seamanship	[M.] (3) [F.] 2	Ship-Building.
Steam-Enginery	[Th.] (3)	Mechanical Drawing.
	[T.] (3) [Th.] (2)	Fabrication of Machinery.
	[W.] (2) [S.] (1)	Marine Engines.
Physics and Chemistry	[M. T. W. Th. F.] (1)	Applied Mathematics.
English Studies, History, and Law	Once a month	Composition.
Modern Languages	[M. T.] (2) [W. F.] (3)	Nautical Phrase Book and Grammar.
FIRST CLASS—FOURTH YEAR.		
Steam-Enginery	[T.] (2) [Th.] (3)	Fabrication of Machinery.
	[M.] (1) [W.] (1)	Designing of Machinery.
	[T. Th. F.] (1)	Mechanical Drawing.
Astronomy, Navigation, and Surveying	[T.] (3) [W. Th.] (2)	Astronomy.
Physics and Chemistry	[W.] (3)	Mechanics.
	[M. F.] (2) [S.] (1)	Light and Heat.
Modern Languages	[M. F.] (3)	Spanish.

Second term: January 31, 1876, to June 20, 1876.

Department.	Periods.	Subjects.
FOURTH CLASS—FIRST YEAR.		
Mathematics	[M. T. W. Th. F.] (2) S. (1)	Algebra and Geometry.
	Once a week	Elective Course.
Steam-Enginery	1st division, [W. F.] (3)	Mechanical Drawing.
	2d division, [T. Th.] (3)	
English Studies, History, and Law.	[M. T. W. Th. F.] (1)	English and History.
Modern Languages	1st division, [M. T. Th.] (3)	Fasquelle's Grammar.
	2d division, [M. W. F.] (3)	
THIRD CLASS—SECOND YEAR.		
Mathematics	[M. T. W. Th. F.] (1)	Analytical Geometry and Descriptive Geometry.
	Once a week	Elective Course.
	M. (3)	Descriptive Geometry.
Physics and Chemistry	[T. Th. F.] (2)	Chemistry.
English Studies, History, and Law.	[M. W.] (2) S. (1)	History and Rhetoric.
Modern Languages	[T. W. Th. F.] (3)	Fasquelle's Grammar and French Composition.
SECOND CLASS—THIRD YEAR.		
Steam-Enginery	[Th.] (2)	Mechanical Drawing.
	[T.] (3) [F.] (2)	Fabrication of Machinery.
	[T.] (2) [Th.] (3)	Marine Engines.
Physics and Chemistry	[M. T. W. Th. F.] (1)	Applied Mathematics and Mechanics.
	[M. W.] (2) [S.] (1)	Electricity.
English Studies, History, and Law.	Once a month	Composition.
Modern Languages	[M. W. F.] (3)	Spanish.
FIRST CLASS—FOURTH YEAR.		
Seamanship	[T. S.] (1)	Naval Architecture.
Steam-Enginery	[F.] (1)	Marine Engines.
	[M.] (2) [Th.] (3)	Fabrication of Machinery.
	[W.] (1)	Designing of Machinery.
	[M. Th.] (1) W. (2)	Mechanical Drawing.
Physics and Chemistry	[T.] (3) [Th.] (2)	Mechanics.
	[M. W. F.] (3)	Physical Measurements.
English Studies, History, and Law.	[T. F.] (2)	Public Law.

FOURTH CLASS.

DEPARTMENT OF MATHEMATICS.

ALGEBRA.

SEMI-ANNUAL EXAMINATION.

JANUARY, 1875.—*Time allowed, five hours.*

1. Simplify $a - \left[5b - \left\{ a - \Big(5c - (2c - b) \Big) + 2a - \Big(3b - (c - 2b) \Big) \right\} \right]$.

Resolve each of the following quantities into its factors:

$a^2 - x^2$, $a^3 + x^3$, $x^2 + (a + b)\,x + ab$, $x^2 + 16x + 63$, $x^4 - 7x^2 - 144$, $x^3 + 4x^2 + 2x - 3$, and separate each of the quantities $x^4 + 4$ and $x^4 + y^4$ into two trinomial factors.

2. Find the least common multiple of $x^2 - y^2$, $x^3 - y^3$, and $x^3 + y^3$.

Simplify—

$$\frac{2}{x - 4} - \frac{x - 3}{x^2 - 4x + 16} + \frac{x^2}{x^3 + 64}.$$

Add together—

$$\frac{b}{(a - b)(a - c)} \text{ and } \frac{a}{(b - a)(b - c)}.$$

Simplify—

$$\left\{ \frac{a + b}{a - b} + \frac{a - b}{a + b} \right\} \div \left\{ \frac{a + b}{a - b} - \frac{a - b}{a + b} \right\}.$$

3. Find the value of—

$$\frac{x^2 - 7x + 12}{x^2 + x + 20} \text{ when } x = 3, \text{ when } x = 4, \text{ and when } x = 5.$$

Find the value of—

$$\left\{ \frac{x - a}{x - b} \right\}^3 - \frac{x - 2a + b}{x + a - 2b} \quad \text{when } x = \frac{a + b}{2}.$$

4. Solve the equations—

$$\frac{7x + 5}{6} - \frac{5x + 6}{4} = \frac{8 - 5x}{12}, \qquad \frac{6x + 8}{2x + 1} - \frac{2x + 38}{x + 12} = 1,$$

and

$$\frac{mx - a - b}{nx - \quad - d} = \frac{mx - a - c}{nx - b - d}.$$

5. Solve the equations—

$$3x + 4y = 18,$$
$$4x + 3y = 17.$$

$$\frac{x}{a + b} + \frac{y}{a - b} = 2a,$$
$$\frac{x - y}{2ab} = \frac{x + y}{a^2 + b^2}.$$

$$5x - 6y + 4z = 15,$$
$$7x + 4y - 3z = 19,$$
$$2x + \ y + 6z = 46.$$

6. Divide the number n into two such parts that the quotient of the greater by the less may be Q, with a remainder R. A and B can do a piece of work in a days, A and C in b days, and B and C in c days. Find the time in which each can do it alone.

7. Extract the square root of 314.16 to three decimal places. Extract the cube root of .0064 to three decimal places. Extract the cube root of 3.38 to four decimal places. Write the formula for $(x+y)^m$ to five terms. Write the nth term of this formula. Develop $\sqrt[3]{\quad - x^3}$ to five terms.

8. Divide—

$$64x^{-1} + 27\,y^{-2} \text{ by } 4x^{-\frac{1}{2}} + 3y^{-\frac{1}{3}}.$$

Multiply—

$$x^4 + x^2 + 1 \text{ by } x^{\frac{1}{2}} + x^{-\frac{1}{2}} + 1.$$

Extract the square root of—

$$(x + x^{-1})^2 - 4(x - x^{-1}).$$

Reduce the following fractions to equivalent forms, with rational denominators:—

$$\frac{\sqrt{\quad} + \sqrt{2}}{2 - \sqrt{2}}, \quad \frac{2 + \sqrt{3}}{1 - \sqrt{2} + \sqrt{3}}, \text{ and } \frac{1 + \sqrt[3]{3}}{1 - \sqrt[3]{3}}.$$

Simplify—

$$\frac{1}{\sqrt{7 + 4\sqrt{3}}}.$$

9. Solve the equations—

$$\frac{x+2}{x+1} + \frac{x+1}{x+2} = \frac{13}{6}, \qquad \sqrt{x+14} + \sqrt{x-14} = 14, \qquad x^4 - 13x^2 + 36 = 0,$$

and—

$$2\sqrt{\quad 2x+1} + x^2 = 23 + 2x.$$

Find a trinomial which will exactly divide $y^4 + y^2 + 1$.

10. Solve the equations—

$$\left.\begin{aligned} x + y + \sqrt{x+y} &= 12 \\ x^2 + y^2 &= 45 \end{aligned}\right\},$$

$$\left.\begin{aligned} \frac{x}{a} + \frac{y}{b} &= 1 \\ x + \frac{b}{y} &= 4 \end{aligned}\right\},$$

and

$$\left.\begin{aligned} \sqrt{x+y} + \sqrt{x-y} &= \sqrt{a} \\ \sqrt{x^2+y^2} + \sqrt{x^2-y^2} &= b \end{aligned}\right\}.$$

ANNUAL EXAMINATION.

JUNE, 1875.—*Time allowed, five hours.*

[Starred * questions may be omitted by lower sections.]

1. Write the square root of each of the following expressions: $12 - 6\sqrt{3}$, $39 + 12\sqrt{3}$, $15 - 4\sqrt{11}$. When is it possible to simplify such an expression as $\sqrt{a \pm \sqrt{b}}$?

Simplify—

$$\frac{1 + \sqrt{-1}}{1 - \sqrt{-1}} \cdot \sqrt{-1}.$$

Find the numerical value of $\frac{+\sqrt{3}}{2 - \sqrt{3}}$ to four decimal places.

*Reduce $\frac{a^{\frac{1}{2}} + b^{\frac{1}{2}}}{a^{\frac{1}{2}} - b^{\frac{1}{2}}}$ to an equivalent form in which the denominator is rational, and negative exponents do not occur.

2. Prove that the equation $x^2 + px + q = 0$ has two roots and no more. Find an ex-

pression for the sum of the roots and for their product. If the roots are equal, what is the relation between p and q? Separate x^4+16 into two quadratic factors.

*If x^2+px+q and x^2+rx+s have a common divisor, what is the relation between p, q, r, and s?

3. Solve the equations—

$$\frac{a}{b+x}+\frac{a}{b-x}=c,$$

$$\frac{1}{x^2-3x}+\frac{1}{x^2+4x}=\frac{9}{8x}$$

$$x^2-ax+\frac{b}{2}(x+a-b)=0,$$

$$*\frac{x^2}{a^{\frac{1}{2}}+b^{\frac{1}{2}}}-(a^{\frac{1}{2}}-b^{\frac{1}{2}})=\frac{1}{(ab^2)^{-\frac{1}{2}}+(a^2b)^{-\frac{1}{2}}}.$$

4. Solve the equations—

$$\left.\begin{aligned}4xy&=96-x^2y^2\\x+y&=6\end{aligned}\right\},$$

$$\left.\begin{aligned}x^2+y^2-x-y&=78\\x+y+xy&=39\end{aligned}\right\},$$

$$*\left.\begin{aligned}\frac{x+\sqrt{x^2-y^2}}{x-\sqrt{x^2-y^2}}&=4\tfrac{1}{4}-\frac{x-\sqrt{x^2-y^2}}{x+\sqrt{x^2-y^2}}\\x(x+y)&=52-\sqrt{x^2+xy+4}\end{aligned}\right\}.$$

5. Find y in terms of x from the equation $y^2-4xy+6y-5x^2-30x+27=0$.

Find x in terms of p, c, m, and e from the equations $x^2+y^2=(p+ex)^2$, $y=mx+c$.

*Find what the value of e must be in order that the two values of x may coincide, and find the corresponding value of x in terms of p and m when $e=0$.

6. Write the development of $(2a-3c)^6$. Develop $(a^2-x^2)^{-\frac{1}{2}}$ to five terms. Write the pth term of the latter development.

*Apply the above development to calculate the value of $\frac{1}{\sqrt{99}}$ to five decimal places.

7. Deduce a formula for the sum of an arithmetical progression in terms of a, d, and n. Deduce a formula for the sum of a geometrical progression in terms of a, r, and n. Find the sum of n terms of the series 3, 5, 7, &c. Find the sum of the geometrical progression $2+\sqrt{3}$, $2-\sqrt{3}$, &c., to infinity.

*The pth term of an arithmetical progression is P, and the qth term is Q; find the first term and the sum of n terms.

8. What is a logarithm? Explain what is meant by the modulus. Give the values of the bases and moduli of the common and Naperian systems. Find the value of $\sqrt[7]{\frac{a\,.\,b\,.\,c\,.\,d}{e\,.\,f\,.\,g}}$, given $a=.003589$, $b=.00015785$, $c=3401.5$, $d=15.785$, $e=22.322$, $f=25.79$, $g=25790000$.

*Prove that $\log_a x=\log_b x\log_a b$.

9. Form the equation whose roots are $2\pm\sqrt{3}$ and $3\pm\sqrt{5}$. Transform the equation $x^4-8x^3+18x^2-15x+14=0$ to another whose roots are less by unity. Transform the same equation to another wanting the second term, and also to one wanting the third term. Find all the roots of $x^6+1=0$.

*Find a root of the equation $x^3-2x-5=0$ to five decimal places.

10. Find n from the formula—

$$n=\frac{\log l-\log[lr-(r-1)S]}{\log r}+1,$$

given $r=1.06$, $l=70.927$, $S=419.72$. Find the value of ϵ^π, given $\epsilon=2.7183$, $\pi=3.1416$.

*Deduce the formula for the number of shot in a triangular pile of n courses.

GEOMETRY.

ANNUAL EXAMINATION.

JUNE, 1875.—*Time allowed, five hours.*

1. Define *straight line, plane surface, right angle, quadrilateral.* Name and define the different classes of quadrilaterals, giving a diagram of each. Prove that the sum of the angles of any plane triangle is two right angles. Prove that the three bisectors of the angles of a triangle meet in a point.

2. Explain the terms *chord, arc, sector, segment, secant, tangent.* Prove that an angle inscribed in a circle is measured by one-half the intercepted arc. Prove that, if through a fixed point within a circumference a chord be drawn, the product of the two segments of the chord is constant.

3. Write formulas for the areas of triangles, trapezoids, and circles, and for the circumference of the circle. What is the diameter of a circle whose area is equal to that of three circles whose diameters are 6 inches, 8 inches, and 24 inches respectively? A certain arc is equal in length to the radius; find its length in degrees, minutes, and seconds.

4. Inscribe a regular decagon in a circle whose diameter is 3 inches, and prove the construction. Find an algebraic expression for the length of a side of the decagon, denoting the radius of the circle by a.

5. Prove that the square described upon the hypothenuse of a right triangle is equivalent to the sum of the squares described on the other two sides. Prove that a line drawn from the vertex of the right angle to the middle of the hypothenuse is equal to one-half the hypothenuse.

6. Define *polygon, regular polygon, apothegm.* Denoting the side of the given polygon by a, find expressions for (1) the diagonal of a square, (2) the altitude of an equilateral triangle, (3) the radius of a circle circumscribed about a regular hexagon, (4) the radius of a circle circumscribed about an equilateral triangle, (5) the radius of a circle inscribed within an equilateral triangle.

7. Define *prism, conical surface, spherical triangle, tri-rectangular triangle.* Write formulas for the volumes and surfaces of the cone, cylinder, and sphere, the volume of the frustum of a cone, and the surface of a zone. Prove that a triangular pyramid is one-third of a triangular prism which has the same base and altitude.

8. State and prove the relation between the parts of a spherical triangle and those lying opposite to them in the polar triangle. Show that the area of a spherical triangle is measured by the spherical excess. If 1″ of spherical excess represents one square mile of surface, what is the diameter of the sphere?

9. The section of a ditch is a trapezoid, of which the parallel sides are 7 feet and 1 foot respectively, and the depth is 6 feet. If its length is a quarter of a mile, how many cubic yards will it contain? What geometrical figure is the ditch? What is the depth of water when the ditch is half full?

10. A heavy sphere is placed in a hollow cone of revolution, the radius of the base of the cone being $\frac{10}{\sqrt{3}}$ inches, and the axis 10 inches. The axis of the cone is vertical and the vertex downward. The space intermediate to the two bodies is filled with water, which just covers the sphere as it begins to flow over. If the sphere be slowly withdrawn, to what depth will the water sink?

THEORY OF EQUATIONS.

ELECTIVE COURSE.

Cadet-Midshipmen J. H. Fillmore, J. H. Glennon, C. N. Atwater, T. S. Rodgers, J. G Quinby, and H. S. Knapp.

Cadet-Engineers I. N. Hollis, F. J. Schell, and G. H. Bull.

JUNE 5, 1875.—*Time allowed, five hours.*

1. Prove that when $f(x)$ is divided by $x - c$ the remainder is $f(c)$. Find the value

of $x^5 - 10x^3 - 9x^4 - 8x^3 - 7x^2 - 6x + 1$ when $x = 11$. Find expressions for the sums of the squares, cubes, and fourth powers of the roots of the equation $f(x) = 0$ in terms of the coefficients.

2. Transform the equation $x^3 + qx + r = 0$ to another whose roots are the squares of the differences of the roots of the given equation; from the result find the condition that the original equation may have equal roots; find also the condition for imaginary roots. Prove that the equation $x^4 + ax^2 + b = 0$ cannot have equal roots.

3. Denoting the roots of the equation $x^3 + 19x + 30 = 0$ by a, b, and c, find the equation whose roots are $a(b + c)$, $b(a + c)$, and $c(a + b)$. The roots of the equation $x^4 - 15x^3 + 70x^2 - 120x + 64 = 0$ are in geometrical progression; find them.

4. Apply Sturm's theorem to find the number and situation of the real roots of the equation $x^4 - 8x^2 - 24x + 7 = 0$, and find the greatest root to six decimal places by Horner's method.

5. Apply La Grange's method to the equation in the preceding question, making two approximations to the value of the greatest root, and thence solve the equation completely.

6. State in general terms the three methods employed for the solution of biquadratic equations, and apply one of these methods to solve the equation of Question 4.

7. Construct on the same axes the loci of the two equations—

$$x^2 - xy - 3x - 2y^2 + 12y - 18 = 0$$

and—

$$4y^2 - 4xy + 5x^2 - 40x - 16y + 96 = 0.$$

8. Find the maximum cone that may be inscribed in a given cone, the vertex of the inscribed cone to be at the centre of the base of the given one. Trace the curves used in the solution.

9. Trace the locus of the equation $y^2 = ax^2 + bx^3$, regarding b as positive, and making a successively positive, zero, and negative. Trace the locus of the equation $y^3 = ax^2 - x^3$.

10. Trace the locus of the equation $y^4 + x^4 - 2a^2y^2 - 2b^2x^2 + b^4 = 0$, determining the co-ordinates of all the points at which a tangent to the curve is parallel to one of the co-ordinate axes.

DEPARTMENT OF ENGLISH STUDIES, HISTORY, AND LAW.

HISTORY.

SEMI-ANNUAL EXAMINATION.

JANUARY 28, 1875.—*Time allowed, five hours.*

[Starred (*) questions are alternatives.]

1. Place, geographically and ethnologically: 1. Provençal. 2. Jutes in England [450 A.D.]. 3. Hellenes. 4. Visigoths [after 410]. 5. Lithuanian. 6. Magyar. 7. Wend. 8. Breton.

2. (*a*) "In the early state of things, the city is always in advance of the great kingdom." Explain this, and apply it to the case of Greece.

(*b*) "The establishment of the Roman Empire was not a formal revolution." Explain. How did the establishment of the empire differ from its abolition, in this respect?

*2. Why was the Peloponnesian War a war of races and principles as well as of states? How was the constitution of the empire modified by Diocletian?

3. Venice and Florence, XIII. century. Compare.

*3. Name the two families that successively held the chief power in Milan in the XIV. century, and tell how the duchy was obtained in the case of each.

4. Name in order the Swabian emperors, and show by a genealogical table their connection with the family that preceded them.

*4. What four German tribes supplied Italy with rulers in the period 476–800? What is the principal name in each line of rulers?

5. "For the very reason that the French kings had once had much less power than either the emperors or the English kings, they came in the end to have much more power than either of them." Explain fully, showing how the continuance of the national assemblies and the introduction of the feudal system in each country helped to produce this result.

6. Give the circumstances connected with the French acquisition of (1) Normandy, (2) Toulouse, (3) Algiers, (4) Corsica.

*6. What German prince was the especial protector of Luther? How does it happen that the successors of this prince are now Roman Catholics, while their subjects are Protestants?

7. "The Scots gained their liberty and the establishment of their religion by the same revolution that enslaved Ireland." Explain fully, giving date.

*7. Apart from religious considerations, what reason had England for sympathizing with the Protestant side in the Thirty Years' War?

710, 732, 1453, 1492, 1571. Connect.

8. What disposition was made of the Netherlands at the Congress of Vienna, and how has the arrangement been modified since that time? [Give dates.]

Describe briefly the Zollverein.

*8. What change was made in 1867 in the political condition of Hungary?

Compare the revolutions of 1830, 1848, and 1851.

9. During the first half of the XVI. century, "there was a long rivalry between France and Spain, which was in some sort a continuation of the dispute between the houses of Anjou and Aragon for the throne of Sicily, as that was a continuation of the older disputes between Guelfs and Ghibelins." Explain in full.

10. Draw a map of central and western Europe as settled in 1815, marking the position [or boundaries] of the following:

1. Leipzig.	7. Austerlitz.	13. Luneville.
2. Sleswick.	8. Saxony.	14. Avignon.
3. Hamburg.	9. Holstein.	15. Netherlands.
4. Bern.	10. Bremen.	16. Gibraltar.
5. Pressburg.	11. Waterloo.	17. Köln.
6. Frankfurt.	12. Trafalgar.	18. Arras.

HISTORY OF THE UNITED STATES.

ANNUAL EXAMINATION.

JUNE 12, 1875.—*Time allowed, five hours.*

[Starred (*) questions are alternatives.]

1. When, where, and how was the first representative assembly organized in America?

*1. 1629, 1684, 1692; Massachusetts charter.

2. (1) Charter government; (2) Writs of assistance; (3) American association; (4 Hartford convention; (5) American anti-slavery society; (6) Crittenden compromise. *Take three.*

3. What form of government prevailed in each of the thirteen colonies in 1740?

*3. State the transfers undergone by Louisiana and Florida between 1760 and 1820, giving dates.

4. State what was accomplished by each of the following treaties: Prussia, 1785; Jay's treaty; Guadalupe Hidalgo; Japan, 1852; Washington, 1871.

5. Name six naval victories in the war of 1812, giving the names of the vessels engaged and the victorious commander in each case.

Jones's cruise in the Bon Homme Richard.

*5. April 19, 1775; April 19, 1861.

Affair of the Chesapeake and Leopard.

6. What compromise settled the difference of opinion between the large and small States in the Federal Convention in regard to equality of votes? How did the first Congress under the Constitution provide a revenue?

*6. What sides were taken by different sections of the country on the tariff question, and what was the cause of the division? What action was taken by South Carolina, and on what grounds?

7. Show the connection between the legislation under which Missouri was admitted as a State and that under which Kansas was organized as a Territory.

8. Connect the seventh annual message of President Monroe in 1823 with the invasion of Mexico by the French.

9. What position was taken by the minister of the United States at the court of Great Britain in regard to the construction of the rams at Liverpool?

*9. Career of the Alabama.

10. Fix the position of—1. Salem. 2. Cape Fear River. 3. Fort Casimir. 4. Cape Breton Island. 5. Acadie. 6. Sault Ste. Marie. 7. Fort Du Quesne. 8. Plattsburg. 9. Princeton. 10. Chattanooga.

ENGLISH GRAMMAR.

SEMI-ANNUAL EXAMINATION.

JANUARY 25, 1875.—*Time allowed, five hours.*

[Starred (*) questions are alternatives.]

PUNCTUATION.

1. State the distinction in use between the apostrophe and period in connection with abbreviated words.

Give the rule for the position of an interrogation-point coming at the same place with quotation-marks.

ENGLISH.

2. Classify the languages comprised in the Teutonic family.

In what two forms did the influence of the early Latin missionaries on the English language show itself?

*2. Describe the formation of a common literary dialect in England.

In what two ways did the influence of the classical revival show itself?

3. Explain the character of the change from the synthetic to the analytic stage in a language.

4. Define any five of the following:—

1. Adjective noun. 2. Passive voice. 3. Substantive noun. 4. Inflexion. 5. Syllable. 6. Future-perfect tense. 7. Auxiliary verb.

5. Give the possessive, singular and plural, of—1. Wolf. 2. Hero. 3. Hoof. 4. German. 5. Englishman. 6. Attorney. 7. Vanity. 8. Ox. 9. Cherub. 10. Fief. 11. Beef.

6. Give the principal parts of the following verbs, with a full explanation in each case:—1. Rend. 2. Flee. 3. Fly. 4. Lay. 5. Lie. 6. Rise. 7. Raise. 8. Lose. 9. Loose.

7. Explain the following etymologically:—1. Particle. 2. Sweetheart. 3. Eyelet. 4. Foundling. 5. Dukedom. 6. Airy. 7. Landscape. 8. Auctioneer. 9. Thankless.

8. Analyze:—

> "But now be ready, for I long full sore,
> To hear the merry dashing of the oar,
> And feel the freshness of the following breeze,
> That sets me free, and sniff the rough salt seas."

Note all the words in the passage which can be used as different parts of speech, and illustrate their various uses.

9. Explain syntactically the words in italics in the following :—

"At length for intermission sake they led him
Between the pillars ; he his *guide* requested
(*For so* from *such* as *nearer* stood we heard,)
As *overtired*, to let him lean *awhile*
With both his arms on those two massy pillars
That to the arched roof gave main support.
He *unsuspicious* led him ; *which* when Samson
Felt in his arms, with head awhile inclined,
And eyes *fast fix't* he stood."

ENGLISH LESSONS.

ANNUAL EXAMINATION.

JUNE 12, 1875.—*Time allowed, four hours.*

[Starred (*) questions are alternatives.]

1. Explain the terms:—1. Synonyms. 2. General terms. 3. Hybrids. 4. Fine writing. 5. Periphrasis.

*1. Define the word *law*, using *custom* as a synonym.

2. State and explain the laws of change in meaning illustrated by the following words:—1. Cunning. 2. Table. 3. Minister. 4. Circumstance. 5. Idea. *Take three.*

3. Show why inexperienced writers naturally use the language of poetry in treating unfamiliar subjects.

*3. Show how obscurity may arise from the ambiguous use of pronouns.

4. Explain :—1. Personal metaphor. 2. Hyperbole. 3. Oratory. 4. Romance. 5. Ballad. 6. Dramatic poem.

How do scientific and non-scientific composition differ ?

5. When are incidents interesting in themselves ?

Why are the incidents in novels generally of a trivial character ?

6. Define: logic, deduction, false generalization, begging the question, proposition of identity, mathematical certainty.

7. What is the use of logic in literature ?

8. What is meant by saying that "a syllogism implies inclusion" ?

Distinguish between essentials and accidents.

9. "The sun of liberty is set; Americans must light the lamp of industry and economy." Expand.

"Good seamen are not reckless men.
The captains of the Cunard steamers are good seamen."

Conclusion ? Draw diagram and explain. Tell which of the terms in the minor premise is distributed.

10. "The end of a true soldier's life is the welfare of his country.
But death is the end of a soldier's life.
∴ This death is necessary for the welfare of his country."

Explain any errors you may see. Point out the major premise, minor premise, major term, minor term, and middle term.

THIRD CLASS.

DEPARTMENT OF SEAMANSHIP.

PRACTICAL SEAMANSHIP.

ORAL EXAMINATION, SPECIMEN-QUESTIONS, JUNE, 1875.

I.

1. How is a stopper clapped on a fall ?
2. Fit a parbuckle ; state its use and the power gained.

3. Measure for each pair of shrouds (lower) in the order they go over the mast-head.
4. Reeve, cut, and fit the fore braces.
5. Make preparations for bending sails.
6. Transport a sheet-anchor from waist to bow.
7. Ship heads ENE. $\frac{1}{2}$ E. on the port tack; how will she head on the starboard tack?

II.

1. How is a selvagee strap made? State its use.
2. Fit a reef tackle. State its use and the power gained.
3. Measure for mast-head pendants, fore, main, and mizzen.
4. Reeve, cut, and fit the main-braces.
5. Make up a lower studding-sail.
6. Make preparations for, and hoist out a launch on port side.
7. Ship heads SW. $\frac{3}{4}$ S. on the port tack; how will she head on the starboard tack?

III.

1. What is a round seizing? How is it passed?
2. Fit a whip and runner. State its use and the power gained.
3. How are royal shrouds fitted?
4. Reeve, cut, and fit the crossjack braces.
5. Describe a foresail, and state how it is fitted.
6. Get a sheet-anchor ready for letting go.
7. Ship heads NNE. on the starboard tack; how will she head running two points free on the port tack?

IV.

1. Make an eye-splice in a wire-rope.
2. Fit a two-fold purchase. State its use and the power gained.
3. Measure for the main-royal stay, stating its lead, place, and manner of setting up.
4. Reeve, cut, and fit the fore-topsail braces.
5. Fit and bend a fore-trysail.
6. Describe and name the different parts of an anchor.
7. Ship heads N. $\frac{1}{2}$ W. on the port tack; how will she head running three points free on the starboard tack?

V.

1. How is a cat's-paw made, and for what is it used?
2. Fit a sail tackle; state its use and the power gained.
3. State in what order the rigging goes over the fore-topgallant mast-head.
4. Reeve, cut, and fit the main-topsail braces.
5. Describe a topsail. How is it fitted for bending?
6. What is understood by ground-tackle?
7. Ship heads ESE. $\frac{3}{4}$ E. on the port tack; how is the wind?

VI.

1. How is a carriek-bend made? for what is it used?
2. Fit a top-tackle. State its use and the power gained.
3. State in what order the rigging goes over a top-gallant mast-head.
4. Reeve, cut, and fit the mizzen-topsail braces.
5. Describe and bend a spanker.
6. Make preparations for heaving up an anchor.
7. Ship heads N. $\frac{3}{4}$ E. on the starboard tack; how will she head on the port tack?

VII.

1. How is the size of a rope indicated?
2. Fit a single whip. State its use and the power gained.
3. How are jib-guys fitted?
4. Reeve, cut, and fit the fore top-gallant braces.

5. Lash, rig, and raise sheers.
6. Describe how sheet-anchors are secured.
7. Ship heads S. $\frac{3}{4}$ E. on the port tack; how will she head on the starboard tack?

VIII.

1. How is a figure-of-eight knot made, and for what is it used?
2. Fit a stay-tackle. State its use and the power gained.
3. Describe the manner of measuring for standing rigging with fore-and-aft and beam drafts.
4. Reeve, cut, and fit the main topgallant braces.
5. Fit and bend a fore topsail.
6. Make preparations for and hoist in a launch on the port side.
7. Ship heads NE. by E. $\frac{1}{2}$ E. on the starboard tack. How will she head on the port tack?

IX.

1. Describe euphroes. State their use.
2. Fit a truss-tackle. State its use and the power gained.
3. What is the running rigging of a ship?
4. Reeve, cut, and fit the mizzen topgallant braces.
5. How do you rattle down the lower rigging?
6. What is the length between the shackles of chain-cables? How are chain-cables bitted?
7. Ship heads NNW. $\frac{3}{4}$ W. on the starboard tack. How will she head on the port tack?

X.

1. Describe back-handed rope and state its use.
2. Fit a single Spanish burton. State its use and the power gained.
3. Measure for topgallant back-stays.
4. Reeve, cut, and fit the fore royal braces.
5. Get the main yard on board.
6. How do you know which end of a chain-cable to bend to the anchor? What is a mooring-swivel?
7. Ship heads SW. $\frac{3}{4}$ S. on the starboard tack. How will she head on the port tack?

DEPARTMENT OF ORDNANCE AND GUNNERY.

ORDNANCE-INSTRUCTIONS.

SEMI-ANNUAL EXAMINATION.

FEBRUARY, 1875.—*Time allowed, four hours.*

1. Give weights of guns, charges, projectiles, and bursting-charges for XV-inch, XI-inch, IX-inch, VIII-inch (6500), 32-pounder (4500); give the same and calibers, for rifles, from Parrott 100-pounder to Dahlgren 12-pounder.
2. Station the crews for IX-inch and VIII-inch guns.
3. Station the crew at an XI-inch pivot-gun; "cast loose and provide;" give orders for working.
4. Give details of the construction and stowage of a magazine having two alleys.
5. Describe the inspection of the bore of an VIII-inch gun; verify the trunnions and adjust the reinforce-sight; give all the marks on a gun "passed."
6. Give rules complete for boarders, riflemen, sail-trimmers, &c., pumpmen, firemen, and pikemen.
7. Divide to cast loose IX-inch gun, and man both sides, full crews; shift left truck.
8. Station a crew for a XIII-inch mortar; give orders for working it.
9. *Provide* a division of IX-inch guns. *Provide* a division of VIII-inch guns.
10. Sketch a pivot-carriage and slide; number and name the parts.

DEPARTMENT OF MATHEMATICS.

TRIGONOMETRY.

MONTHLY EXAMINATION.

DECEMBER 31, 1874.—*Time allowed, two and a half hours.*

[Answers to five questions required.]

1. Deduce formulas for the solution of the equation—

$$\tan (a + z) = m \tan z.$$

Find z from the equation—

$$2.325 \cos z + 13.45 \sin z = 4.327.$$

2. Deduce the formulas—

$$\tan^2 \tfrac{1}{2}x + 2 \cot x \tan \tfrac{1}{2}x - 1 = 0,$$
$$\tan^2 \tfrac{1}{2}x - 2 \cos x \tan \tfrac{1}{2}x + 1 = 0,$$

assuming only the fundamental formulas of plane trigonometry. What two cases are there in the trigonometric solution of the equation $x^2 + px + q = 0$? Deduce formulas for the solution of one of these cases.

3. Find x from the equation—

$$x^2 + 1.0895x - 6.8195 = 0.$$

4. State De Moivre's theorem, and demonstrate it for integral values of n (positive and negative). Apply the theorem to find the sine and cosine of $3x$ in terms of the functions of x. What method may be used in writing the tangent of nx in terms of the tangent of x?

5. What three cases are there in the trigonometric solution of the equation—

$$x^3 + ax + b = 0?$$

Deduce the formulas for the solution of the first case.

6. Solve the equation $x^3 + 6x^2 + x - 2 = 0$, deducing the necessary formulas.

SEMI-ANNUAL EXAMINATION.

JANUARY 25, 1875.—*Time allowed, five hours.*

[Any two questions may be omitted.]

1. Define *sine, versed sine, cosine.* State the limiting values of each of the trigonometric ratios. Given $y = \operatorname{cosec} x$, find the cosine and cotangent of x. Find the circular measure of $\sec^{-1} 3$. Find log cotan of $11' 15''$. Given sine $x = \frac{3}{5}$, find the sine, cosine, and tangent of $2x$ and of $3x$ without the tables.

2. Assuming the fundamental formulas (sine and cosine of $(x \pm y)$), deduce the following:

$$\tan (x \pm y) = \ldots\ldots, \quad \sin x + \sin y = \ldots\ldots,$$
$$\sin x - \sin y = \ldots\ldots, \quad \cos x + \cos y = \ldots\ldots,$$
$$\frac{\sin x + \sin y}{\cos x + \cos y} = \ldots\ldots, \quad \frac{\sin (x+y)}{\sin (x-y)} = \ldots\ldots.$$

Write the formulas for the sine, cosine, and tangent of $\frac{x}{2}$, and deduce the formulas—

$$\sin x = \frac{2 \tan \frac{1}{2}x}{1 + \tan^2 \frac{1}{2}x}, \quad \cos x = \frac{1 - \tan^2 \frac{1}{2}x}{1 + \tan^2 \frac{1}{2}x}.$$

3. A ship's mast is 126 feet in height from the truck to the water-line, and subtends an angle of $1^\circ\ 30'\ 30''$; find the distance of the ship. The altitude of a triangle is 10, and the angles at the base are 30° and 45°; find the sides and area *without tables.* A person standing on the bank of a stream observes the angle subtended by a tree on the opposite side to be 60°, and when he retires 40 feet from the stream the angle is 30°; determine the height of the tree and the width of the stream without using tables.

4. Assuming the trigonometric ratios of 30° and 45°, find the sine, cosine, and tangent of 15°. Deduce the sine, cosine, and tangent of 18°. Find the tangent of $\{\sin^{-1}\frac{3}{5} + \cos^{-1}\frac{5}{13}\}$ without the tables. Find all values of x less than 2π which satisfy the equation $\sin 3x + \sin 2x = \sin x$.

5. Enunciate and prove each of the three theorems by which the solution of plane oblique triangles is effected.

6. Deduce formulas for the sine, cosine, and tangent of half an angle of an oblique plane triangle in terms of the sides. Deduce also a formula for the area in terms of the sides.

7. In an oblique triangle, given $A = 60°$, $a = 10$, $b = 10\sqrt{2}$; find B and c by dividing the triangle into two right triangles, without using tables. Eliminate θ from the equations—

$$x \sin\theta + y\cos\theta = a,$$
$$x\cos\theta - y\sin\theta = b.$$

8. Given $A = 54° 30' 45''$, $a = 42.356$, $b = 51.234$. Solve the triangle.

9. From the deck of a ship sailing due east a light-house bore ENE. ½ E., and after sailing 8 miles it was observed to bear N. by E. Find the distance of the light-house from the ship at the last observation, and find how near to it the ship passed.

10. Find z from the equation—

$$3\cos z + 6\sin z = 5.$$

Find the value of $x(\sin x)^{\cos z}$ when $x = \tan^{-1}\sqrt{2}$.

11. A person walking along a straight road observes the greatest elevation of a tower to be α; from another straight road he observed the greatest elevation to be β. The distances of the points of observation from the intersection of the two roads are a and b. Find the height of the tower.

12. From a vessel, A, another vessel, B, bears N. α W. A steams a miles per hour; B steams b miles per hour, and steers N. β W. Show that in order to intercept B, A must steer N. $(\phi + \alpha)$ W.: ϕ being found from the equation $\sin\phi = \frac{b}{a}\sin(\beta - \alpha)$.

SEMI-ANNUAL EXAMINATION.

JANUARY 27, 1875.—*Time allowed, five hours.*

1. Prove that in any spherical triangle the cosine of either side is equal to the product of the cosines of the other two sides plus the continued product of the sines of those sides and the cosine of the included angle. Show that this theorem is true when the parts of the triangle are not restricted to values less than 90°. Apply the formula—

$$\cos^2\tfrac{1}{2}A = \sin^2\tfrac{1}{2}(B-C)\sin^2\tfrac{1}{2}a + \sin^2\tfrac{1}{2}(B+C)\cos^2\tfrac{1}{2}a$$

to the polar triangle.

2. Deduce formulas in which the sine, cosine, and tangent of half an angle of a spherical triangle are expressed in terms of the sides.

3. Deduce all the formulas necessary for the solution of right spherical triangles, and state Napier's rules.

4. Deduce Napier's analogies.

5. Given $C = 90°$, $B = 110° 46' 20''$, $a = 115° 38' 40''$; solve the triangle.

6. Given $L = 30° 30' 40''$ N., $d = 19° 20' 30''$ S., $h = 28° 20' 30''$; find t, adapting the formula for $\sin^2\frac{1}{2}A$ to this case.

7. Given $t = 2^h 30^m$, $d = 12° 30' 30''$ N., $L = 45° 30' 30''$ N.; find h and Z.

8. Given $c = 90°$, $A = 30° 30' 30''$, $B = 110° 30' 30''$; solve the triangle.

9. Given $B = 132° 18' 30''$, $C = 139° 44' 20''$, $c = 127° 30' 10''$; solve the triangle, using Napier's rules.

10. With the same data as above solve the triangle, using Napier's analogies.

ANALYTICAL GEOMETRY.

MONTHLY EXAMINATION.

MAY 25, 1875.—*Time allowed, two and a half hours.*

1. Deduce the equation to the normal to the parabola, $y^2 = 4ax$, in terms of m, the direction ratio of the normal.

Find an expression in terms of e for the tangent of the angle included between two tangents drawn at the extremities of a parameter of the ellipse. Find the rectangular equation to the ellipse in terms of p and e, when the origin is taken at the intersection of these two tangents, and the co-ordinate axes remain parallel to those of the ellipse.

2. Find in terms of a, b, and c, the equation to a straight line which passes through the upper extremity of the right-hand parameter of the hyperbola $a^2y^2 - b^2x^2 + a^2b^2 = 0$, and also through the point where the tangent, at the nearest vertex, meets the asymptote. Find the length of a perpendicular from the focus upon the line. What does the latter expression become when the hyperbola is rectangular? Prove that a tangent to the hyperbola bisects the angle between the lines drawn from the foci to the point of contact.

3. The eccentricity of an ellipse is $\frac{1}{2}\sqrt{2}$; a parabola whose parameter is one-half the minor axis of the ellipse has the same vertex and axis; find the co-ordinates of the points of intersection of the two curves, taking the origin at the common vertex. Find the equations to those tangents to the hyperbola $a^2y^2 - b^2x^2 + a^2b^2 = 0$ which pass through the upper focus of its conjugate.

4. Find the equation to the tangent to $\sqrt{x} + \sqrt{y} = \sqrt{a}$ in terms of its direction ratio m; and find the equation to the locus of the foot of the perpendicular let fall from the focus upon this tangent.

5. Two normals to the parabola $y^2 = 4ax$ meet at right angles; from the foot of the ordinate to the point of intersection, a distance equal to $\frac{1}{4}$ the parameter is measured toward the vertex. Prove that the straight line joining the end of this distance with the point of intersection is also a normal.

ANNUAL EXAMINATION.

JUNE, 1875.—*Time allowed, five hours.*

1. Find the angle between the lines $2y - x - c = 0$ and $3y + x - c = 0$. Find the length of the perpendicular from (3, 5) upon $3y - 7x + 9 = 0$. Prove analytically that the three lines drawn from the vertices of a triangle to the middle points of the opposite sides meet in a point.

2. Deduce the formulas—

$$x = X\cos\alpha - Y\sin\alpha$$
$$y = X\sin\alpha + Y\cos\alpha$$

Find what the equation—

$$x^2 + y^2 + xy - 10x - 11y + 37 = 0$$

becomes when the origin is removed to the point (3, 4) and the axes are turned through an angle of 45°.

3. Deduce the criterion by which we determine what conic is represented by any equation of the form $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$. State what loci this equation may represent (1) when $B^2 > 4AC$; (2) when $B^2 = 4AC$; (3) when $B^2 < 4AC$. Show that when the axes are rectangular $\tan 2\alpha = \frac{B}{A - C}$, where α denotes the inclination of an axis of the conic.

4. Deduce the equations of the tangent and normal to the parabola, each in terms of its own direction ratio. Prove that perpendicular tangents to the parabola meet on the directrix. Find the equations to tangents to $y^2 = 4ax$ passing through $\left(-a, \frac{3a}{2}\right)$.

5. Define the ellipse, and deduce its rectangular equation in terms of the semi-axes. Deduce the rectangular and polar equations to the ellipse when the origin is taken at the left-hand focus. Find the equations to the locus of the foot of a perpendicular let fall from the focus of an ellipse upon the tangent.

6. Explain the terms *subtangent, subnormal, pole* and *polar, radical axis.* Of what points is the radical axis the locus? Deduce expressions for the subtangent and subnormal to the parabola and ellipse. Explain a method of constructing a tangent to any conic, (1) at a given point on the curve, (2) through a given point not on the curve; illustrate by diagrams.

7. Reduce the equation $y^2 - 2xy + x^2 - 6y - 6x + 9 = 0$ to its simplest form by transformation of co-ordinates. Construct the locus of the equation $y^2 + xy + x^2 + y + x - 5 = 0$, and find what the equation becomes when the conic is referred to its centre and axes.

8. Find the locus of the middle point of a line joining the extremities of two conjugate diameters of the ellipse. The abscissa of the focus of an hyperbola referred to its centre and axes is 5, and the equation to the tangent at a point whose ordinate is $2\frac{1}{4}$ is $4y - 5x + 16 = 0$; find the equation to the hyperbola.

9. Trace the loci of the equations—

$$y^2 = x\,(x+1)\,(x+3),$$

$$x^4 - ax^2y + ay^3 = 0,$$

$$r^2 = \frac{a^2 \sin 3\theta}{\cos\theta}$$

10. Two straight lines are drawn parallel to the major axis of an ellipse at a distance $\frac{b}{e}$ from it; prove that the part of any tangent intercepted between them will be divided by the point of contact into two parts subtending equal angles at the centre.

DEPARTMENT OF PHYSICS AND CHEMISTRY.

CHEMISTRY.

ANNUAL EXAMINATION.

JUNE, 1875.—*Time allowed, four hours.*

1. Express by symbols the chemical change which results when sulphuric acid diluted with water is poured upon metallic zinc, and show how this experiment illustrates the essential characteristics of an acid. Write another reaction illustrating the same point.

2. What is meant by the allotropic forms of an element? Give all the examples you have had.

3. How is the molecular weight of bodies which can be readily volatilized determined, and upon what law does the process depend?

4. What information regarding the substance ammonia is condensed into the symbol NH_3?

5. Given sodium-carbonate and sulphuric acid, calculate the weight of acid necessary to produce 2.273 litres of carbon dioxide under normal conditions. Explain your work and analyze the reaction.

6. Iron-rust destroys sails. Charcoal destroys sewer-gases. Explain the action in these cases, and give other illustrations where this principle obtains.

7. Discuss the theory of the composition and use of gunpowder, and show the products of its combustion. Describe also the process of manufacture of nitro-glycerine, and show wherein lies the difference in properties of the two explosives.

8. What volume of hydrogen arsenide at 55° C. and 73 cubic metres can be obtained from 15 cubic metres of As. (sp. gr. 5.76)? Describe the properties of hydrogen-arsenide, giving its volume composition.

9. How is hydrochloric acid manufactured? Describe the substance fully.

10. Write the empirical, typical, and graphic formulas for the following substances,

and point out in the graphic formulas the atomicity and quantivalence of each element State upon what type they are written.

Silver nitrate,	Calcium phosphate,
Lead nitrate,	Ammonium iodide,
Potassium sulphate,	Hydrogen phosphide,
Hydrogen sodium carbonate,	Sulphurous acid.

DEPARTMENT OF ENGLISH STUDIES, HISTORY, AND LAW.

RHETORIC.

ANNUAL EXAMINATION.

JUNE 15, 1875.—*Time allowed, five hours.*

[Starred (*) questions are alternatives.]

1. Explain reasoning by analogy, the straining of a metaphor, turgidity, prolixity, explicit reference, obverse iteration, taste.

2. What conditions are necessary in order that figures should aid the understanding? that they should heighten the feelings? that they should be a source of pleasure?

3. Distinguish between simile and metaphor.

"The coining of metaphors is a means of increasing the names in a language." Explain.

*3. Why does English give specially good opportunities for personification? Give the various forms of synecdoche.

4. Explain what is meant by plurality of knowledge, and show what connection it has with antithesis. When is redundancy permissible?

*4. What is the object and what are the sources of brevity? "Words and expressions most nearly related in thought should be placed closest together." Why?

5. Name six cases in which coujunctions may be safely dispensed with in connecting sentences.

*5. Give the rules for the structure of the paragraph.

6. Give Blair's rules for unity.

7. "The more general a notion is the more difficult it is to conceive." Explain.

8. What conditions must be fulfilled in order that the description of imposing objects may be a source of strength or sublimity, in composition?

*8. Name some combinations of syllables that are opposed to melody. [*Give four, at least.*]

9. Distinguish between a loose sentence and a period.

10. *Official report.*

Write an official report, giviug an account of the survey of the harbor of San Juan del Norte by a party under your direction, describing the chauges that have takeu place since the last survey, and stating your opiuion as to the probability that the port will eventually recover its commercial advantages.

SECOND CLASS.

DEPARTMENT OF SEAMANSHIP.

SHIP-BUILDING.

SEMI-ANNUAL EXAMINATION.

JANUARY, 1875.—*Time allowed, four hours.*

WOODEN SHIP BUILDING.

1. Describe the keel, and explain the manuer of scarfing the different lengths. How is the stem united to the keel? How is the stern-post secured to the keel? Where should the scarf of the keelson be placed?

2. Describe a frame; state fully the names of its different parts and the manner of uniting them. What is the joint of a frame? What are filling-timbers, and where placed?

3. Describe cant-frames and hawse-pieces; their object; how secured. Describe a deck-hook. State the use of chocks, where placed, how secured.

4. Give the names and positions of the different strakes of outside and inside planking. State fully the manner of securing a deck-beam to the ship's side.

5. Describe the manner of working bitts. Describe the kind of rudder to be used on a steamer having a stationary propeller.

6. Define the different docks used in this country, and describe manner of docking a vessel in the ordinary dry-dock.

7. Make all preparations for launching.

IRON SHIP BUILDING.

8. Describe the different kinds of keels used in the transverse system of framing and state the manner of forming the scarf in each case.

9. Describe the frame of an iron ship built on the transverse system, and show how the framing differs when the vertical keel is *intercostal* and when *continuous*.

10. Describe the different kinds of beams used and the modes of securing them to the ship's side.

NAVAL TACTICS.

ANNUAL EXAMINATION.

JUNE, 1875.—*Time allowed, four hours.*

I.

Draw a diagram of a fleet of twenty-four vessels in line, natural order. Show by means of brackets how it is divided into divisions and squadrons, placing the name of each over its bracket. Show by whom commanded, by placing the number denoting order of rank to the right of the name of division or squadron.

State positions of commander-in-chief, division, and squadron commanders. Draw a diagram of a fleet of twelve vessels in column, natural order.

Show as above how they are divided, named, and commanded. State the positions of commander-in-chief and division commanders. State the distance between vessels at half distance, in close order, and in open order.

II.

Draw diagrams of fleet in double echelon, in natural, in reverse, inverted, and reverse-inverted order. What is echelon in bow-and-quarter line, and how is it formed?

III.

The commander-in-chief signals, "Fleet wheel to NE.," the fleet being in line, heading north. Show how the front can be changed by another method, giving all the necessary signals to be made by the commander-in-chief. How do you make the compass-signal N. $\frac{3}{4}$ W.?

IV.

The fleet being in column of vessels in natural order, heading north, form it into columns of vessels abreast by divisions, preserving the original direction.

V.

The fleet being in columns of vessels abreast by divisions in natural order, heading north, form it into column of vessels on the right division in natural order, and preserving the original direction.

VI.

The fleet being in columns of vessels abreast by divisions in natural order, heading north, change direction to NE.

VII.

The commander-in-chief signals: "From the vessel whose distinguishing pennant is shown above this signal, form *double echelon*."

Supposing the distinguishing pennant of No. 13 to be shown, re-form the line to the front.

VIII.

The fleet being in column of vessels by the wind and headed off, restore the order on the same tack. The wind veers aft, restore the order on the same tack.

SEAMANSHIP.

ORAL EXAMINATION, SPECIMEN-QUESTIONS, MAY, 1874.

I.

1. Reeve, cut, and fit the fore braces.
2. How do you cross a topsail yard?
3. How is a fish-davit rigged?
4. Cut, fit, and set up the main topmast backstays, wire-rope.
5. Set a mainsail, blowing fresh.
6. Ship running four points free, all drawing sail set, light weather, haul up close-hauled.
7. A 12½ pts. ship, wind ESE. ¾ E.; how would the ship head on each tack respectively, if 1¼ pts. free?

II.

1. Reeve, cut, and fit the lower boom topping-lifts.
2. Make preparations for bending sails.
3. Rig and raise sheers.
4. Cut, fit, and set up the topmast rigging, wire-rope.
5. Take in a mainsail, blowing fresh.
6. Ship close-hauled on the starboard tack, keep away ten points; light weather, make sail.
7. A 12½ pts. ship, wind WSW. ¾ W., ship 1¾ pts. free on the port tack; what is the compass-bearing of a light-house on the weather quarter?

III.

1. Reeve, cut, and fit the fore topsail braces.
2. Mizzen mast in, transport sheers and take in the main mast.
3. Rig purchase, and get over whole tops.
4. Cut, fit, and set up lower rigging, wire-rope.
5. Take in the topgallant sails, on a wind, fresh breeze.
6. Sails loosed to a bowline, furl them.
7. The wind blows from NW. by W. ½ W. on the port quarter of a ship; how does a light bear per compass on the lee quarter?

IV.

1. Reeve, cut, and fit the lower boom topping-lift.
2. Make up a topmast studding-sail ready for setting.
3. Secure an anchor for sea.
4. Cut, fit, reeve, and set up the fore topgallant stay, wire-rope.
5. Take in the topgallant sails, before the wind, fresh breeze.
6. Make preparations for loosing sail and loose to a bowline.
7. A 12½ pts. ship, wind WSW. ¾ W., ship 1¾ pts. free on the port tack; what is the compass-bearing of a light on the weather quarter?

V.

1. Reeve, cut, and fit the main braces.
2. Make up a lower studding-sail ready for setting.
3. Secure the lower yards for purchasing heavy weights.
4. Cut, fit, reeve, and set up the fore royal stay, wire-rope.
5. Set the main trysail in a fresh breeze.
6. Under royals, reduce sail to single-reefed topsails.
7. A 12½ pts. ship, wind blows from SE. ½ E., and the ship is 2⅝ pts. free on the starboard tack; how does a light-house bear on the lee quarter?

VI.

1. Reeve, cut, and fit the spanker-boom topping-lift.
2. Lash, rig, and raise sheers.
3. Rig purchase, and get guns out through the ports.
4. Cut, fit, and set up the fore stays, wire-rope.
5. Set a jib in a fresh breeze.
6. Make sail to royals, giving all the orders, and state what is done at each command.
7. A 12½ pt. ship heads SSW. ½ W., 2½ pts. free on the starboard tack; with the same wind, how would she head 2½ pts. free on the port tack?

VII.

1. Reeve, cut, and fit the cross-jack braces.
2. Fit and bend a main trysail.
3. Get inboard sheer-legs, rig them, and raise them.
4. Cut, fit, reeve, and set up the jib-stay, wire-rope.
5. Take in a main try sail, fresh breeze.
6. Make preparations for bringing ship to anchor: call all hands and see officers and men at their stations.
7. A 12½ pt. ship, wind blows from SE. ½ E., and the ship is 2⅝ pts. free on the starboard-tack; how does a light-house bear on the lee quarter?

VIII.

1. Reeve, cut, and fit the main topsail braces.
2. How do you rattle down lower rigging?
3. Explain the mode of measuring for rigging by draft.
4. Cut, fit, and set up the bowsprit shrouds, wire-rope.
5. Haul down a jib, fresh breeze.
6. Make preparations for sea; see officers and men at their stations.
7. A 12½ pt. ship heads SE.; she is on the starboard tack 3¾ pts. free, and has a light-house on the lee quarter: what would be the relative bearing of that light from the ship, if with the same wind she were 3¾ pts. free on the port tack?

IX.

1. Reeve, cut, and fit the mizzen topsail braces.
2. Make up and bend a mizzen topsail.
3. Call all hands and get ready to heave up anchor.
4. Cut, fit, and set up the jib-guys, wire-rope.
5. Set a lower studding-sail.
6. Close-hauled; all plain sail set; keep away two points and make all sail.
7. A ship heading North has the wind on the starboard quarter, and a light-house on the lee quarter; what would be the relative bearing of the light if the ship were running with the same wind on the port quarter?

X.

1. Reeve, cut, and fit the fore topgallant braces.
2. Make up a jib for bending, and bend it.
3. Get a chain-cable on board, stow, bend, and bitt it.
4. Cut, fit, and set up the flying-jib martingale, wire-rope.
5. Take in a lower studding-sail.
6. Wind on the quarter, starboard studding-sails set; bring by the wind on the other tack.
7. The wind blows from SE. by E. ¾ E. on the starboard quarter of a ship, and then comes out dead ahead; give the ship's head when close-hauled to the new wind on the starboard tack.

DEPARTMENT OF ORDNANCE AND GUNNERY.

INFANTRY-TACTICS.

SEMI-ANNUAL EXAMINATION.

JANUARY, 1875.—*Time allowed, four hours.*

1. Give the four exercises for setting-up.
2. Give the formation of a company in line, and with ranks open, with the posts of commissioned and non-commissioned officers; and the distances between ranks marching in quick time, double time, and over rough ground.
3. Give the principles of the wheel and the turn; the general rules in reference to the guide; and, being in line at a halt, describe the wheel to the left.
4. Give the three general rules to avoid repetition in the manual of arms. Describe the secure from the carry, the right-shoulder from the support, the unfix bayonet from the order, the load in four times, and the aim in the direct fire and to the right and left oblique.
5. Being in line at a halt, form single rank and re-form double rank; form column of files and re-form column of fours.
6. Deploy a company as skirmishers by both flanks, change direction to the left on the centre, and open fire.
7. Give the formation of a regiment in line, with the posts of the commissioned and non-commissioned officers, and the general rules for successive formations.
8. A column of companies having partly changed direction to the right, form line before all the companies enter the new direction and open fire by company and by file.
9. Being in line, form double column of fours and re-form the line.
10. Deploy a battalion as skirmishers by numbers, and rally on the battalion.

GUNNERY.

ANNUAL EXAMINATION.

JUNE, 1875.—*Time allowed, four hours.*

1. Sketch a blast-furnace. Letter and catalogue the parts.
2. Describe blowing-in; working the furnace; various blasts; their economy.
3. Give a table of fusibility.
4. Describe the composition of gray, white, and mottled cast irons. How do silicon, manganese, sulphur, and phosphorus affect them?
5. Describe wrought iron. Sketch a puddling-furnace. What chemical reactions take place?
6. Describe briefly various kinds of steels, and the methods of producing them.
7. Describe various bronzes and alloys for guns. Give the constituents, strengths, and peculiarities; also the circumstances affecting their production and casting.

8. What qualities are reqnired in the metal for gnns? Give a general comparison of the cannon-metals. Which is the best? Why?

9. Define elasticity and ductility. Define, and illnstrate by a diagram, the modnlus of elasticity and work done in producing rnptnre.

10. Describe tersely the details of manufacture of a 7-inch Fraser gnn.

DEPARTMENT OF ASTRONOMY AND NAVIGATION.

ASTRONOMY.

ANNUAL EXAMINATION.

JUNE, 1875.—*Time allowed, five hours.*

1. Define vertical circles, honr-circle, prime vertical, celestial latitude, celestial longitude, right ascension, declination, altitude, azimuth, amplitude, sidereal time, apparent time, mean time, hour-angle, sidereal year, tropical year, anomalistic year, geocentric and heliocentric parallax, conjnnction, and the line of nodes of a planet's orbit.

2. Discuss fully the equation of time. What is its value, at any instant, in terms of the true sun's right ascension and longitude?

3. Explain how to find the heliocentric longitude of an inferior planet's node from observations made when the earth is not on the line of nodes of the planet, and when the planet's distance from the sun is not known.

4. How is the inclination of a planet's orbit to the plane of the ecliptic found? How are the right ascensions and declinations of stars determined? What gives rise to the difference in length between sidereal and solar days?

5. Name the different kinds of solar eclipses. Dednce, in terms of parallax and semi-diameter, an expression for the solar ecliptic limits, and show from it when an eclipse will take place. State upon which limb of the sun first contact takes place, and in what direction the shadow of the moon traverses the earth.

6. Show how to obtain the horizontal parallax of the moon, and thence its distance from the earth.

7. Deduce the formnla for finding the geocentric parallax of a heavenly body. Give the method of finding the heliocentric longitude of a planet when the periodic times of the earth and planet are given as well as the planet's elongation and geocentric longitude.

DEPARTMENT OF PHYSICS AND CHEMISTRY.

ELECTRICITY.

SEMI-ANNUAL EXAMINATION.

JANUARY, 1875.—*Time allowed, four hours.*

1. Explain the laws of electrical indnction, both statical and dynamical. Give the laws in the latter case.

2. Explain the induction of currents by magnets and the construction of one of the machines for developing a current by a magnet.

3. Explain the construction of the gravity-battery in which Zn. and Cn. are nsed. What are the chemical reactions which take place?

4. Define electro-motive force, strength of cnrrent, and resistance. Discnss Ohm's law, $S = \frac{E}{R}$.

5. Describe the method of finding the intensity of the earth's magnetism at any point. Explain the inductive action of the earth on soft iron.

6. How is a compass-card constructed? how supported, and for what reasou?

7. Describe the construction of a torpedo-fuse, to be used with frictional electricity. In what particulars should it differ from a fuse to be ignited by dynamical electricity, and why?

8. Find equivalent of Siemen's unit of resistance in copper wire 2 millimetres in diameter: conductivity of copper, 99.9; of mercury. 1.6.

9. How is a thermo-element constructed? How is the current produced? How does the E. M. F. of a thermo-element compare with the E. M. F. of a hydro-element?

10. Describe Wheatstone's bridge, and the manner of using it to measure resistances.

11. Wishing to explode a sub-marine mine, in which are two fuses in continuous circuit, each fuse having a resistance of one ohm at the firing-point, the resistance of the leading wires being 18 ohms, and strength of current necessary to fire a fuse being .75 webers; how many cells of the following dimensions must be employed, and how must they be arranged?

1st case. { E. M. F = .6 volt. / Int. res = .4 ohm.

2d case. { E. M. F. = 1 volt. / Int. res. = 4 ohms.

APPLIED MATHEMATICS.

SEMI-ANNUAL EXAMINATION.

JANUARY 25, 1875.—*Time allowed, five hours.*

MECHANICS.

Five solutions required.

1. Show that the algebraic sum of the momeuts of any number of forces, acting in one plane on a particle, taken about any point in their plane, is equal to the moment of their resultant about the same point.

2. A spanker-gaff a feet long (weight w) is hung by throat and peak halliards, whose directions make angles denoted by α and β respectively with the gaff; the centre of gravity of the gaff is b feet from the jaws; find the tensions on the halliards, and the thrust on the mast.

3. Find the distance of the centre of gravity of a hemispherical bowl from the base; a being the internal radius and b the thickness. From this result find the position of the centre of gravity of a hemispherical surface.

4. The altitude of a right cone is h, and the diameter of its base b; a string is fastened to the vertex and to a point in the circumferenee of the base, and is then put over a smooth peg. If the cone rests with its axis horizontal, what must be the length of the string?

5. A weight is supported upon a smooth plane, inclined at an angle α to the horizon by a force which is exactly equal to the pressure on the plane; find the direction of this force.

6. A uniform straight beam (length b) rests horizoutally ou a rough cylindrical barrel (radius a); required the greatest weight which can be suspended from one end of this beam without causiug it to slip off, the coefficient of friction being u.

DIFFERENTIAL CALCULUS.

Five solutions required.

1. Give the limits between which each of the inverse trigonometric functions is taken, and the reasons for thus restricting the values of these functions.

Derive the value of $d\left[\sec^{-1}\frac{mx}{a}\right]$ in terms of x, m, and a.

2. Trace the curve $y = \log_e x$, and prove that, if the point whose abscissa is e be joined to the origin, the joining line will be a tangent to the curve.

3. The crank of a small steam-engine is one foot long, and revolves uniformly at the rate of two turns per second, the connecting-rod being five feet in length; find the velocity of the piston when the crank makes an angle of 45° with the line of motion of the piston-rod; also, when it makes an angle of 135°, and an angle of 30°.

4. Expand $e^{\sin z}$ by Maclaurin's theorem (four terms).

5. Given $\log_e 7 = 1.9459102$ to find $\log_e 51$ to five decimal places.

6. Find the length of the shortest fence that will divide a given triangular field into two equal parts; the sides of the given field being a, b, and c.

7. Required, the number of parts into which a number a must be divided; in order that the continued product of the parts may be a maximum.

MECHANICS.

WEEKLY EXAMINATION.

APRIL 2, 1875.—*Time allowed, two and one-fourth hours.*

One question may be omitted.

1. Show that the intensity of the attractive force of the sun is the same for all the planets at the same distance from the sun.

Prove that—

$$velocity = \frac{rate\ of\ area}{perpendicular\ on\ tangent}.$$

2. Find the velocity and periodic time in the case of a body revolving in a circle at a distance of 60 radii from the earth's centre.

3. Determine the orbit that a body will describe when acted upon by a force varying inversely as the square of the distance, assuming the equation

$$c^2\left[\left(\frac{du}{d\omega}\right)^2 + u^2\right] - 2\int f\frac{du}{u^2} = c'.$$

4. Deduce a general expression for the velocity of a planet at any point of its orbit. Show how Kepler's third law may be deduced from his first and second laws.

5. Assuming that the force of attraction of the sun on a planet varies inversely as the square of the distance of the planet from the sun, deduce Kepler's third law.

6. Find the least initial velocity which will enable a body projected from the earth to reach the moon, the radius of the moon being three-elevenths that of the earth, and the distance between the centres sixty times the earth's radius.

APPLIED MATHEMATICS.

ANNUAL EXAMINATION.

JUNE 17, 1874.—*Time allowed, five hours.*

Ten solutions required.

1. Find the entire length of the curve—

$$\left(\frac{x}{a}\right)^{\frac{2}{3}} + \left(\frac{y}{a}\right)^{\frac{2}{3}} = 1.$$

2. Find the volume of a life-preserver in the form of a ring generated by the revolution of an ellipse about an axis parallel to its minor axis; the outside radius being 18 inches, the inside radius 12 inches, and the thickness of the ring 4 inches. Deduce the general formula employed.

3. Find the displacement of the fore-body of a ship constructed on the "wave-line" principle, the midship-section being a semi-ellipse and the stem vertical; length of fore-body 100′, half-breadth 20′, and draught of water 15′.

4. At 8 o'clock p. m., a ship is 65 miles NE. of a certain point; she is required to be 5 miles from this point at daylight (4 o'clock a. m). It being known that there is a

current running E. of 2 miles per hour, on what course, and at what speed, should the ship steam?

5. The resistance of the air to the motion of a projectile being proportional to the cube of its velocity, find general integral expressions for the co-ordinates of any point of its path.

6. Deduce the formula for determining differences of altitude by means of a barometer.

7. How many men weighing 150 pounds each will a balsa weighing 225 pounds, and having a volume of 30 cubic feet support, the specific gravity of a man being 1.1?

8. The horizontal axis of a circular sluice-gate 4 feet in diameter is 4 inches below the centre of the gate. How high will the water rise above the centre before its pressure opens the gate?

9. Find the amount of water that will flow in five minutes through a rectangular hole in a ship's side caused by the removal of an iron plate 2 feet long and 15 inches wide (the longer edge being parallel to the water-line, and the upper edge 5 feet below it). Deduce the formula employed.

10. A rifle-shot is in the form of a cylinder two calibres in length surmounted by a paraboloid one and a half calibres in height. If it is discharged with a velocity of 1200 feet per second, and makes one turn in 40 feet, compare the work of rotation with that of translation.

11. If the work of driving a steamer through the water be proportional to the cube of her speed, find the cheapest rate of steaming against a current of a knots per hour.

12. A ship by ramming another reduces her speed from v feet per second to u feet per second; the height of the centre of gravity of each of her broadside-guns above the deck being a, and the distance between their trucks b, find the relation which must exist between a, b, u, and v in order that the guns may not capsize.

FIRST CLASS.

DEPARTMENT OF SEAMANSHIP.

PRACTICAL SEAMANSHIP.

ORAL EXAMINATION, SPECIMEN-QUESTIONS, JUNE, 1875.

I.

1. Reeve the gear of the lower studding-sail.
2. Fit and set up the fore topmast stay, wire-rope.
3. How does a ship carry her helm when trimmed by the head?
4. Set a mainsail, blowing fresh.
5. Ship riding head to wind and tide, get under way and cast to port.
6. By the wind, weather main topsail brace parts; what is to be done?
7. Sailing-vessels meeting, one with wind three points on the starboard quarter, the other with the wind two points on the starboard quarter; which has the right of way?

II.

1. Reeve the cat-fall and cat an anchor.
2. Fit and set up the fore-stay, wire-rope.
3. How does a ship carry her helm when trimmed by the stern?
4. Take in a mainsail, blowing fresh.
5. Ship is riding head to wind; get under way and stand out before the wind.
6. Wind on the starboard quarter; weather main topsail brace parts; what is to be done?
7. Steamers meeting, one steering north, the other southwest: which has the right of way?

III.

1. Reeve the gear of the main topsail.
2. Fit and set up the main topmast stay, wire-rope.
3. What kind of a helm ought a ship to carry on a wind?
4. Set a close-reefed topsail.
5. Scudding, with the wind on the starboard quarter, the ship broaches to; what is to be done?
6. Before the wind, the mizzen topgallant parrel carries away; what is to be done?
7. Steamers meeting, one steering south, the other south by east; which has the right of way?

IV.

1. Reeve the gear of the spanker.
2. Fit and set up the mizzen stay, wire-rope.
3. Should your ship, on a wind, carry too much weather helm, how would you remedy it.
4. Take in a close-reefed topsail.
5. Moderate breeze, wind on the starboard quarter, all drawing sails set, a man falls overboard; what is to be done?
6. What is to be done when, in hauling down the jib, the down-haul parts?
7. Sailing-vessels meeting, one steering east-northeast, the other west, the wind being north; which has the right of way?

V.

1. Reeve the gear of the main sail.
2. Fit, reeve, and set up the flying-jib stay, wire-rope.
3. Should your ship, on a wind, carry much lee helm, how would you remedy it?
4. Take in topgallant sails, on a wind, blowing fresh.
5. By the wind, under all plain sail, a man falls overboard; what is to be done?
6. Weather sheet and clewline of main topsail carried away; what is to be done?
7. Sailing-vessels meeting, wind south, one steering east-southeast, the other west; which has the right of way?

VI.

1. Reeve the main brace.
2. Fit, reeve, and set up the jib-stay, wire-rope.
3. What are the terms used in conning ship?
4. Take in the topgallant sails before the wind, blowing fresh.
5. By the wind, under all plain sail, you are struck by a squall; what do you do?
6. Parrel of main topsail yard carried away; what is to be done?
7. Steamers meeting, one steering south, the other northeast; which has the right of way?

VII.

1. Reeve the cross-jack and mizzen topsail braces.
2. Cut, fit, and set up lower rigging, wire-rope.
3. Set a main trysail, blowing fresh.
4. Trim yards close-hauled; moderate weather.
5. Riding to ebb-tide by starboard anchor, wind on the starboard beam; get under way and stand out on the port tack.
6. By the wind, main spring-stay parts; what is to be done?
7. Sailing-vessels meeting, wind north, one heading west-northwest, the other east-northeast; which has the right of way?

VIII.

1. Reeve the mizzen topgallant and royal braces.
2. Cut, fit, and set up topmast rigging, wire-rope.
3. How do you trim yards close-hauled, fresh breeze? Why?
4. Set a jib, blowing fresh.
5. Riding to tide, wind aft, get under way from the starboard anchor and stand out on the port tack.

6. Cross topgallant and royal yards, and bend the gear.

7. Sailing-vessels meeting, wind south, one heading west, the other east; which has the right of way?

IX.

1. Reeve the fore topsail brace.

2. Cut, fit, and set up the topgallant rigging, wire-rope.

3. In loosing sails, which gaskets are cast off first? Why?

4. Take in a jib, blowing fresh.

5. Riding to the tide by the port anchor, wind aft, get under way and stand out before the wind.

6. Send down the topgallant and royal yards.

7. Steamers meeting, head on; what is the rule of the road to avoid collision?

X.

1. Hook on and hoist a quarter-boat in a sea-way.

2. Cut, fit, and set up the topgallant backstays, wire-rope.

3. How do you get the main tack close down?

4. Set a lower studding-sail.

5. Riding head to tide, wind two points on the starboard bow, get under way and stand out on the port tack.

6. Send down the topgallant masts at sea.

7. What lights are carried by steamers and what by sailing-vessels at sea? What lights are carried by vessels at anchor? Being officer of the deck at night, you sight a red light two points on the starboard bow; what does this indicate?

NAVAL ARCHITECTURE.

ANNUAL EXAMINATION.

JUNE, 1875.—*Time allowed, five hours.*

1. Name and describe the principal qualities sought in a ship. On what principle does buoyancy depend? What is the centre of gravity of a vessel? What is the centre of buoyancy?

2. What is stability, and how does an excess of it affect a vessel? How is easy rolling insured in a vessel? Explain the difference between stiffness and steadiness in a vessel.

3. What is the trapezoidal rule? What are Simpson's first and second rules? Work out the formula for Simpson's second rule.

4. Give the rule for finding how far a given single weight must be shifted in order to shift the common centre of gravity through a given distance in the same direction. What are the plans from which measurements are taken to find the displacement and stability of a vessel, and what measurements are obtained of each?

5. How is the displacement of a vessel computed? How is the centre of buoyancy determined? What is the coefficient of fineness, and what is its use in designing a vessel? Describe the curve of displacement.

6. Deduce formulas for determining the centre of gravity of a vessel equipped for sea, and explain a practical method of making the calculations. What is the metacentre of a vessel?

7. Explain fully what measurements are required, and the method of computing the registered tonnage according to the United States tonnage-laws. How do you determine the centre of effort of the sails of a ship?

8. On what does the limit of safety of ships as regards capsizing depend? Draw the curve of stability and discuss it.

9. Name and explain fully the different lines used in designing a ship. How do you find the augmented surface of a ship and compute the probable speed?

10. State the principles of the wave-line theory, and show the advantage of constructing a ship upon it. Given the length of entrance and run, construct the line most favorable to speed.

DEPARTMENT OF ORDNANCE AND GUNNERY.

ORDNANCE AND ARMOR.

SEMI-ANNUAL EXAMINATION.

JANUARY, 1875.—*Time allowed, four hours.*

1. Describe fully all gun-metals; discuss their relative values.
2. Discuss laminated and solid armor with reference to racking and punching.
3. Define the systems of rifling; give types, merits, and defects of each.
4. State the objects of rifling; causes of drift, long range, high initial velocity, best form of projectile for range and for penetration under different conditions.
5. Explain the strains due to rifling; examples. What is the best form of groove?
6. Describe fully manufacture, rifling, projectiles, &c., of 100-pounder Parrott rifle.
7. Explain the manufacture, give theory of construction, and discuss the merits of the Vavasseur gun.
8. Explain the manufacture, theory of construction, and discuss the merits of the Woolwich (Fraser) gun. Set a breech-sight to counteract drift.
9. Describe the manufacture of the Krupp gun; give the peculiarities of rifling, projectiles, and breech-closing apparatus.
10. Give the theory and construction of the Parsons proposed converted XI-inch rifle. Describe the Reffye projectile and breech-closing apparatus; Whitworth projectiles and breech-closing apparatus.

DEPARTMENT OF STEAM-ENGINERY.

MARINE-ENGINES.

ANNUAL EXAMINATION.

JUNE 15, 1875.—*Time allowed, four hours.*

I.

Sketch an indicator-diagram from a condensing-engine. Describe its main features, and explain its uses.

II.

What disadvantage that is not incurred in inland waters, attends the use of steam-engines at sea? Describe the means employed to countervail this disadvantage.

III.

Describe any apparatus that you know of, by which the admission of steam to the cylinder is suppressed before the stroke of the piston is completed, and explain why such suppression is desirable.

IV.

Describe the compound engine.

V.

Compute the indicated horse-power of a steam-engine from the following data, viz: mean unbalanced pressure upon piston, 50 pounds; back-pressure, 5 pounds; diameter of piston, 60 inches; stroke of piston, 36 inches; double strokes of engine per minute, 70; measure of expansion, 2; $\log \varepsilon = .693$. Give the absolute terminal pressure.

VI.

Estimate the quantity of water that will be required for effecting condensation in the case of Question V, the temperature of the feed being 120° F., of the sea 60° F., of the steam discharged from the cylinder 254° F., the latent heat 935 units, and the weight of one cubic foot of the steam at terminal pressure .0815 pound.

VII.

In the case of Question V, what per centum of the whole quantity of coal used might have been saved had the engine been employed on Lake Erie instead of at sea? Data concentration at sea, $\frac{1\frac{2}{3}}{32}$; at Lake Erie, $\frac{0}{32}$.

VIII.

Sketch and describe two kinds of apparatus for indication of pressure in boilers and condensers, explaining their several modes and principles of action.

IX.

The maximum speed of a steamer being 12 knots when consuming 60 tons coal per diem, compute the speed and the daily consumption of fuel with which she may steam 2880 miles with most dispatch, consuming 500 tons of coal.

X.

In the case of Question IX, the maximum number of revolutions of the vessel's screw being 70 per minute, compute the slip of the screw in per centums of its speed.

DEPARTMENT OF ASTRONOMY AND NAVIGATION.

NAVIGATION.

ANNUAL EXAMINATION.

JUNE, 1875.—Time allowed, five hours.

THEORY OF NAVIGATION.

1. Deduce the formulas for computing the great-circle course and distance between two places on the earth's surface, given by their latitudes and longitudes; and, also, the formulas for computing the latitude and longitude of this great circle's vertex.

2. Deduce the formulas for computing the latitude at sea from an observed altitude of a heavenly body off the meridian, when you have given the Greenwich chronometer-time, the longitude by observation, and the latitude by dead reckoning.

What two advantages does this method possess over the versin method given in Bowditch's Navigator?

With the above data, when does this method fail at sea?

3. State the optical principle of the construction of a sextant. Explain how to adjust a sextant, using in the operation the sea-horizon.

4. Deduce the formula for computing by the sine the hour-angle of a heavenly body, and the formula for finding by the cosine the azimuth of a heavenly body, when you have given for both the altitude of the body and the Greenwich chronometer-time, as well as the latitude and longitude of the observer.

When the latitude at sea is uncertain, when should the observation for longitude be made; and what, at that time, would be the effect of a small error in the Greenwich chronometer-time and in the altitude?

5. Explain how, in a given port, you would rate the chronometer of a ship on Greenwich mean time:

1st, by single altitudes of the sun;

2d, by double altitudes of the sun;

3d, by equal altitudes of the sun.

State concisely all that a careful navigator should do in each of the above cases to obtain the best possible rating.

6. Deduce all the formulas necessary for computing, at a given place, the astronomi-

cal bearing of a distant light-house when the angle between the sun's nearest limb and the light-house is measured with a sextant, and the local mean time noted; and, also, the altitude of the light-house above the sea-horizon is measured with a sextant.

PRACTICAL WORK IN NAVIGATION.

JUNE, 1875.—*Time allowed, nine hours.*

1. June 18, 1875. At Boston Light, Massachusetts, in longitude $4^h\ 43^m\ 32^s$ W. Required the time of the p. m. high water, the corrected establishment being $11^h\ 12^m$. Which will be the higher, this or the a. m. tide of the same civil day?

2. December 9, 1875. Being at sea, in latitude 41° 30′ N. by dead reckoning, and in longitude $4^h\ 30^m\ 43^s$ W., as brought forward from the morning *time-sight* of the sun, observed with a sextant the altitude of the sun's lower limb, 23° 16′ 20″; index-correction of sextant + 2′ 20″; height of eye above the sea, 18 feet; watch-time of observation, $10^h\ 29^m\ 33^s$ a. m.; chronometer — watch, $4^h\ 18^m\ 13^s$; and the chronometer-correction on Greenwich mean-time + $22^m\ 29^s$; the latitude is required.

3. July 30, 1875. On shore, at a place in latitude 11° 12′ 16″ S., and in longitude $11^h\ 28^m\ 15^s$ W. of Greenwich, I observed equal altitudes of the sun east and west of the meridian, with a sextant and artificial horizon, as follows:

A. M. watch-times of observation:

$8^h\ 21^m\ 01^s.5$
$8\ \ 21\ \ 29\ .0$
$8\ \ 21\ \ 58\ .0$

P. M. watch-times of observation:

$3^h\ 40^m\ 39^s.5$
$3\ \ 41\ \ 08\ .5$
$3\ \ 41\ \ 38\ .5$

Twice the altitudes of the sun's lower limb observed:

43° 20′
43 30
43 40

Before the a. m. observation, compared the chronometer and watch as follows:

Chro., $7^h\ 11^m\ 33^s.5$
Watch, $7^h\ 52^m\ 59^s.0$

And after the p. m. observations, compared again as follows:

Chro., $3^h\ 53^m\ 32^s.5$
Watch, $4^h\ 32^m\ 11^s.0$

At each set of observations, the barometer was 30.10 inches, and the thermometer 70°, and the index-correction of the sextant + 2′ 10″. Required the error of the chronometer on Greenwich mean time.

4. June 13, 1875. At Annapolis, Md., in latitude 38° 59′ N., and in longitude $5^h\ 5^m\ 7^s$ W., swung ship for the local deviation of her standard compass, as follows:

Times of observation.		Ship's head by standard compass.	Simultaneous bearings—	
On board.	On shore.		Of a theodolite on shore by standard compass.	Of the standard compass by the theodolite.
h. m.	*h. m.*			° ′
9 30	9 30	NNE.	N. 50° W.	110 30
9 36	9 36	ENE.	N. 55° W.	108 00
9 40	9 40	ESE.	N. 57° W.	105 00
9 50	9 50	SSE.	N. 61° W.	103 30
10 2	10 2	SSW.	N. 63° W.	102 00
10 7	10 7	WSW.	N. 58° W.	104 00
10 14	10 14	WNW.	N. 54° W.	106 00
10 25	10 25	NNW.	N. 50° W.	108 00

The theodolite read, when pointing along the zero-line, 100°. Required the local deviation of the standard compass for the ship's head on the given points. If the variation, by chart, was 9° westerly, what course, in degrees and minutes, must be steered by this standard compass to make a true course of NNE.; also of ENE.?

5. June 13, 1875, a. m. Latitude 34° 16′ 10″ N.; longitude 8^h 39^m 44^s E. Required the local apparent time when the star α Arietis is in the eastern horizon, and its amplitude when rising.

6. June 20, 1875, a. m. Longitude 7^h 52^m 46^s E. Observed with a sextant the meridian altitude of the moon's upper limb 35° 18′ 30″, bearing South; eye 18 feet above the water, and index-correction of the sextant + 2′ 20″. Required the latitude.

7. February 5, 1875. Latitude 10° 20′ 30″ S.; longitude West. In the morning twilight, observed with a sextant the altitude of Venus, 23° 15′ 20″; watch-time of observation, 4^h 48^m $08^s.5$ a. m.; chronometer — the watch, 2^h 39^m 17^s; chronometer-correction on Greenwich mean time, — 23^m $03^s.5$; index-correction of sextant, + 2′ 20″, and eye 18 feet above the water. Required the longitude.

8. December 13, 1875. Latitude 34° 22′ 11″ S.; longitude 1^h 14^m 1^s E. Observed with a sextant the angular distance of the sun's nearest limb from the vertical edge of a light-house in the true horizon, and to the right of the sun 43° 31′ 20″; the index-correction of the sextant being + 2′ 20″. The watch-time of the observation was 7^h 1^m $31^s.5$ a. m.; the chronometer minus the watch, 10^h 54^m $17^s.5$; and the chronometer-correction on Greenwich mean time — 11^m $32^s.5$.

Required the true altitude and azimuth of the sun, and the true azimuth of the light-house. If the variation was 5° easterly, what was the correct magnetic bearing of the light-house?

9. April 15, 1875. At noon took departure from a light-house in latitude 49° 55′ N.; longitude 5° 15′ W., bearing per compass NNE. and 10 miles distant; the ship's head being N. and the *local deviation* on that heading ¾ point westerly. Variation by chart 1½ points westerly. Thence sailed:—

20 knots 0 fms.	S W. by W.	Wind, Sd. and Ed.	Lee-way, 1½ pts.	Deviation, ½ pt. W.
22 knots 0 fms.	SSW.	Wind, Sd. and Ed.	Lee-way, 1½ pts.	Deviation, ¼ pt. W.
15 knots 4 fms.	WSW.	Wind, Nd.	Lee-way, 1½ pts.	Deviation, 0.
10 knots 0 fms.	W. by S.	Wind, Nd.	Lee-way, 1½ pts.	Deviation, ¼ pt. E.
*8 knots 4 fms.	W.	Wind, Nd.	Lee-way, 1½ pts.	Deviation, ½ pt. E.

Required the latitude and longitude and the course and distance made good from the light-house to this position by *dead reckoning*.

10. On April 16, 1875, observed, with a sextant, the meridian altitude of the sun's lower limb, 52° 15′ 10″, bearing South; the eye being 18 feet above the water, and the index-correction of the sextant + 2′ 20″. Required the latitude.

On April 16, 1875, about 9 a. m., observed with a sextant the altitude of the sun's lower limb, 37° 40′ 00″. The watch-time of the observation was 8^h 45^m; the chronometer minus the watch, 30^m 30^s; and the chronometer-correction on Greenwich mean time, + 10^m 20^s; the eye was 18 feet above the water, and the index-correction of the sextant + 2′ 20″.

At the same time, the sun's bearing, per standard compass, was S. 36° E., the ship's head being North. Variation from chart 17° westerly.

Required the longitude at noon, and the local observed deviation of the standard compass, for the ship's head at North. Required, also, the direction and rate per hour of the current.

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* Run to noon, April 16, from a. m. *line-sight*.

DEPARTMENT OF PHYSICS AND CHEMISTRY.

SOUND AND LIGHT.

SEMI-ANNUAL EXAMINATION.

JANUARY, 1875.—*Time allowed, five hours.*

1. Upon what does the intensity of sound depend? Explain the causes which influence the intensity of sound.

2. Explain the undulatory theory of light, and give some of the facts that decided in favor of this theory.

3. Explain the phenomenon of single refraction according to the undulatory theory.

4. Explain the manner in which a concave mirror forms an image. A lighted candle is placed in front of a spherical mirror, the candle being perpendicular to the axis and in the same plane with it; find how the image moves as the candle burns.

5. Deduce and discuss the formulas for spherical mirrors. The flame of a candle 2″ in height is placed in front of a concave mirror of 3′ radius, at a distance of 10′; find the position and magnitude of the image.

6. What is meant by the critical angle of a substance? Show under what conditions a ray of light which has been refracted at one face of a prism will emerge at the second face.

7. Explain the cause of the dark lines of the solar spectrum. What proof have we of the cause of these lines? Under what conditions are these lines visible?

8. Explain the construction of the refracting astronomical telescope. The focal length of the object-glass of a telescope is 40′.53, and of the eye-piece 0″.52; what is the magnifying power of the telescope?

9. Explain the phenomenon of diffraction produced by parallel rulings on glass.

10. What do you understand by plane polarization of light? How is a ray polarized? How do you determine whether light is polarized?

11. Find the magnifying power of an astronomical telescope whose object-lens has a focal length of 10′.27, and eye-piece a focal length of 0″.5, for a person whose distance of distinct vision is 15″.

HEAT.

ANNUAL EXAMINATION.

JUNE, 1875.—*Time allowed, four hours.*

1. Change into centigrade the following temperatures Fahrenheit:—

Melting-point of mercury	−40°
Melting-point of wax	158°
Melting-point of tin	442°
Intense white heat	9732°

How many degrees Fahrenheit in $n°$ centigrade?

2. The French unit of heat is the quantity of heat required to raise the temperature of one kilogramme of water from 0° C. to 1° C.; the English unit is the quantity of heat required to raise the temperature of one pound avoirdupois of water from 39° F. to 40° F. What is the relation between the two units? (One kilogramme = 2.2046 pounds.)

3. What relation exists between the linear and cubical coefficients of expansion of a solid?

A bar of metal is 5.875 metres long at 10° C., and 5.888 metres long at 75° C.; what is the coefficient of expansion of the metal?

4. Explain the nature of the correction to be applied to the barometric height for temperature. Deduce the form of the correction for any case where H is the height at $t°$ C., h the height at 0° C., and d and d' the densities of mercury at these two temperatures, respectively. What are the reduced heights of the barometer observed as follows?—

770 millimetres at −20° C.
730 millimetres at −10° C.

5. State the laws of fusion as determined by experiment. What is latent heat of fusion?

6. To determine the latent heat of fusion of lead, 200 grammes of melted lead (temperature 335° C.) was poured into 1850 grammes of water at 10° C. After the lead had cooled, the temperature of the water was found to be 20°.76 C. Required latent heat of fusion of lead, the specific heat of lead being 0.00314.

7. Explain the construction and use of Regnault's hygrometer.

8. Calculate the weight P of a volume V of moist air whose hygrometric state is E, and temperature t; height of barometer H; the density of aqueous vapor being $\frac{5}{8}$ that of dry air.

9. What influence does the moisture in the atmosphere have upon the temperature of the earth? Give explanation.

10. Define specific heat, and explain how the specific heat of a solid or liquid is determined by the method of mixtures. All corrections required.

11. A shell weighing 350 pounds upon striking the side of a ship has its velocity diminished from 1500 to 500 feet per second. How much heat will be developed by the blow? To what temperature would the shell be raised if it receives one-half the heat, specific heat of iron being 0.12983?

12. Explain specific heat under constant pressure and specific heat under constant volume.

13. Knowing the specific heat of air under constant pressure and under constant volume, how may the mechanical equivalent of heat be calculated? A cubic foot of air at 0° weighs 1.29 ounces, and the specific heat of air under constant pressure is 0.24 as compared with an equal weight of water.

DEPARTMENT OF ENGLISH STUDIES, HISTORY, AND LAW.

LAW.

ANNUAL EXAMINATION.

JUNE 11, 1875.—*Time allowed, five hours.*

[Starred (*) questions are alternatives.]

CONSTITUTION OF THE UNITED STATES.

1. Describe the process of amendment.

2. With whom rests the power of impeachment? the power of trying impeachments? of choosing Senators? of compelling the attendance of members of either House, in default of a quorum? of appointing Judges? of defining the punishment of treason? of making treaties of peace? of declaring war?

INTERNATIONAL LAW.

3. Define International Law, and show upon what basis it rests.

With what writer, and at what time, did the modern system of International Law begin?

*3. Explain any two of the following: municipal law, civil law, common law, statute law, constitutional law.

When are foreign powers justified in recognizing the independence of a revolted state?

4. State the rule of law as to the confiscation of government bonds held by the enemy, and give the reason for it.

What was the policy of the United States during the civil war, in regard to confiscation of enemy's property and debts?

*4. Define domicile. What is the test of domicile?

What is the effect of a foreign domicile in time of war? [Two cases: 1. Neutral domiciled in a belligerent country. 2. Subject of belligerent government domiciled in a neutral country.]

5. Explain what is meant by the recognition of belligerency in the case of a rebellion, and show how it affects the relations of the government, (1) with the party in revolt, (2) with other governments.

Apply this in the cases of the Cagliari and Virginius.

*5. Explain the difference between combatants and non-combatants.

Explain the treatment of non-combatants by hostile forces on land and at sea.

Explain the position taken by the leading states of Europe, at the Brussels conference of 1874, in regard to treatment of non-combatants.

6. Explain fully any three of the following:—

1. Bottomry-bonds.
2. Registry, enrollment, and license.
3. General average.
4. Bill of lading.
5. Contraband.

7. State in full the distinction drawn, as to ship and cargo, in adjudging upon a neutral the penalty for—

1. Breach of blockade.
2. Carrying contraband.
3. Carrying enemy's dispatches.

*7. Define postliminy, and state the limitations of the law as to (1) time [in England and in the United States]; (2) place; (3) property [real, personal, movables]; (4) persons.

8. State the provisions of the Declaration of the Congress of Paris in 1856. What objection was urged by the United States to the first of these principles? (that relating to privateering). How was the objection met in the war of 1861?

*8. In case of a violation of neutrality by one belligerent, from whom do the injured parties seek reparation?

Illustrate in the case of the Florida.

9. War between the United States and Spain: in command of the U. S. Steamer Dictator, cruising in the West Indies, you fall in with a fleet of French merchant-vessels, under convoy of a French man-of-war; the commander of the latter declares on his word of honor that there is no breach of neutrality connected with the voyage, and requests you to waive the right of search. He states his intention of making a forcible resistance if his request is not complied with. [N. B.—No treaty with France on this subject.]

Later, you capture a bark owned in Rio, and engaged in carrying contraband to Havana. She is taken into port and condemned on that ground. It appears that she was originally an American vessel, but captured early in the war by the Spanish, condemned as enemy's property, and sold to the firm in Rio. The original owner puts in a claim. How is it to be decided?

10. Some time after, you speak and search two vessels, both American, and trading between New York and Havana, one a brig under a license from the Spanish government, the other a bark under a license from the Department of State of the United States. What would you do?

Later, you find a third vessel, a neutral, licensed like the last, bound for Havana from Halifax, having on board cavalry saddles and uniforms, which the owner of the ship is sending as a part of the cargo, along with other merchandise belonging to himself and other parties. Consequences?

CADET-ENGINEERS.

FIRST CLASS.

DEPARTMENT OF STEAM-ENGINERY.

STEAM-ENGINERY.

ANNUAL EXAMINATION.

JUNE 1875.—*Time allowed, four hours.*

[*Starred questions may be substituted for any others excepting VI and VII.]

I.

Define displacement-tonnage and burden-tonnage. State how they compare in naval steamers, and in which of them the weights of machinery and fuel are included.

II.

According to the wave-line theory, what should be the lengths of the fore and the after bodies of a vessel for a speed of 18 knots an hour? What is the nature of the curves, and how are they constructed?

III.

Define the terms wetted surface and augmented surface. Calculate the quantities from the following data:

Mean squares of sines of greatest obliquity	.0252
Mean of the fourth powers of the same	.0008
Length of load-water line	304 feet.
Length of mean immersed girth	40 feet.

IV.

Calculate the I. H. P. for a vessel whose augmented surface is that of Question III, for a speed of 18 knots an hour. Datum: co-efficient of propulsion, 20,000.

V.

Find the diameter of the cylinders of a pair of condensing non-compound engines of 4000 I. H. P. of 4 feet stroke of piston, with total clearance of $6\frac{1}{4}$ % of the space-displacement per stroke; the revolutions, 55 per minute; boiler-pressure, 50.36 pounds per square inch, by gauge; cut-off at 31 inches from beginning of stroke; compression at 5 inches before end of stroke; vacuum, 24 inches; barometer, 30 inches. Give also the width of the steam-ports of the cylinders, their length being 51 inches.

VI.

In the case of Question V, it is desired to cut off the steam at $\frac{7}{8}$ the stroke from the beginning, the steam-opening to commence when the piston is $\frac{1}{2}$ inch from beginning of stroke; exhaust-closure to take place when the piston is 5 inches from the end of stroke. Give the steam and exhaust lap; the travel of valve; the steam and the exhaust lead opening, when the crank is at the dead-points. Give all results in inches.

VII.

In the case of Questions V and VI, a Mayer's expansion-valve is to be applied, to cut off from $\frac{1}{2}$ to $\frac{7}{8}$ the stroke. At *least* rate of expansion, the blocks to be together; and at greatest rate of expansion, $10\frac{1}{4}$ inches apart. The greatest distance between

centers of main and cut-off valves, in the direction of and during their respective movements, to be 4½ inches. Give the least width of each expansion-block, and the travel of the expansion-valve in inches, and show, by the Zeuner diagram, its position as regards angular advance.

VIII.

Give the area of feathering paddles for a vessel having 13,000 square feet augmented surface; coefficient of friction, .0036; slip of wheel, 20 % of speed of ship; paddles working in still water.

Give the diameter of a screw for the same vessel; circumference to be double the pitch; diameter of the hub one-fourth that of the screw; apparent slip 20 % of speed of vessel; working in water that moves with the vessel at one-tenth of the vessel's speed.

IX.

Give the thickness of a cylindrical boiler-shell 10 feet in diameter, double-riveted, for the engines of Question V, the factor of safety being 6.

Give also the grate-surface, the heating-surface, and the calorimeter, in square feet and the number of the boilers.

X.

Give the condensing-surface of the engines of Question V in square feet, the diameter of the circulating (double-acting) pump, the stroke being that of the steam-piston; temperature injection, 85°; discharge, 115°; exhaust steam, 215°; hot well, 125°.

*XI.

Sketch and describe the leading features of four types of screw-propellers in common use.

XII.

Sketch and explain an ejector-condenser.

ANNUAL EXAMINATION.

JUNE 12, 1875.—*Time allowed, five hours.*

I.

By what thermometric scale may the laws of the phenomena which depend upon temperature be most simply expressed? State what fixed point, other than the standard points of ordinary scales, pertains to it. Give formula and explain notation.

II.

Give the weight of air, in pounds, that will be required for the combustion of 1000 pounds of coal, composed of C, 0.87; H, 0.05; and O, 0.04. Give the per centum of fuel utilized in an engine each horse-power of which costs two pounds of this coal.

III.

The density of the water off Point Lookout being $\frac{\frac{1}{2}}{32}$ and the concentration of the water in a steam-launch boiler $\frac{1\frac{1}{2}}{32}$, what per centum of the whole quantity of water pumped into the boiler should be withdrawn to preserve this ratio of densities? Give the loss incurred in per centum of the fuel utilized. Data: Feed-water, 70° F.; steam, 311°; latent heat, 898°.

IV.

If, in the case of Question III, heat in the water blown out should be imparted to the feed-water, raising its temperature to 100° F., how much would the loss by blowing be reduced?

V.

A wrought-iron tube has a length of 8 feet, external diameter of 3 inches, thickness of metal $\frac{1}{16}$ inch. Give the ratio that will exist between the resistances it will offer to collapsing and to bursting, the tensile strength being 50,000 pounds per square inch.

VI.

Calculate the diameter of a shaft for a pair of condensing-engines 60 inches diameter and 48 inches stroke of piston; cranks set at 90°, and the maximum steam-pressure by gauge 50 pounds per square inch.

VII.

Discuss the comparative merits of long and of short stroke engines, and explain why the latter are commonly employed in naval screw-steamers.

VIII.

Describe the two common types of compound engines, pointing out in what their action is different from that of common non-compound engines.

IX.

Sketch diagrams illustrating the action of steam in compound engines of two cylinders, working upon the same crank-shaft, but through separate cranks; and working receivers.

X.

A vessel can steam 8 knots an hour on 20 tons of coal a day; what is the greatest speed at which she can make a passage of 2,500 miles, under steam alone, with 300 tons of coal? Give also the consumption of coal per diem.

DEPARTMENT OF PHYSICS AND CHEMISTRY.

CHEMISTRY.

SEMI-ANNUAL EXAMINATION.

JANUARY, 1875.—*Time allowed, five hours.*

1. State the three laws which define the molecular condition of a gas.

2. Write the various reactions by which carbon dioxide is formed. How many litres of it at 15°.5 C. and 74 cubic metres will be obtained from 500 grammes of sodium carbonate? Give the calculation in full, and explain each step. What are the chief characteristics of this gas?

3. Under what conditions does the energy of combustion take the form of light or of mechanical force? Illustrate by lime-light and by gunpowder.

4. What is meant by the valence of an atom? Give the formulas of four simple compounds which indicate the valence of the atoms of chlorine, oxygen, nitrogen, and carbon, respectively, and state what means we have for verifying the formulas given.

5. Butyric acid and acetic ether have the same percentage composition and the same vapor density; how does the chemist explain the difference in their properties? What do you call such bodies?

6. Define the terms alcohol, glycol, fat acid, acid salt, and basicity of an acid, and give examples of each. Show by typical formulas the constitution of an alcohol; a glycol; glycerine.

7. What peculiar properties adapt coal (carbon) to its use as fuel? State concisely how and whence its inherent energy is derived.

8. Describe the processes for preparing cast iron; wrought iron; steel by cementation; steel by Bessemer's process.

9. State what part carbon protoxide plays in metallurgy. Describe what changes take place in the candle-flame, and state what conditions must obtain when we wish to increase the light, and when we wish to increase the heat.

10. Name the substances represented by each of the following formula: H H, O O, H Cl, H_2 O, H_3 N, C H_4, N O, C O_2, S O_2, H N O_3, H_2 S O_4, K H O, Ca H_2 O_2, Na Cl, Ca Cl_2, Na_2, S O_4, K N O_3.

11. Write a reaction by which ammonia can be obtained. What is ammonium? What elements are closely allied to it? Show what reasons we have for grouping them together.

HEAT.

SEMI-ANNUAL EXAMINATION.

JANUARY 26, 1875.—*Time allowed, five hours.*

1. If a copper bar is 3.5 metres long at 15° F., what will be its length at 40° C., the coefficient of linear expansion by the centigrade scale being .000017?

How may the coefficient ofapparent expansion of mercury be determined?

2. In correcting the barometric height for temperature, is the coefficient of real or apparent expansion of mercury used? A barometer stands at 750 millimetres at 18° C.; what is its corrected reading, the coefficient of expansion of mercury being .0001795?

3. What is the influence of pressure on the melting-point? Describe the Carré apparatus for making ice.

4. What is the weight of 4 litres of dry air at 20° C., and pressure 745 millimetres, the dew-point being 10° C. and the tension of aqueous vapor at 10° C. being 9.165 millimetres?

5. What are Dalton's laws concerning the mixture of gases and vapors?

What common phenomena show that the atmosphere may contain aqueous vapor when the temperature of the air is below 0° C.?

What relation exists between the radiating and absorbing powers of a body? What substance will transmit nearly all luminous and non-luminous rays? What substance will cut off the luminous rays and transmit the non-luminous? What substance will cut off the non-luminous and transmit the luminous?

7. Deduce the corrected formula for determining specific heat by the method of mixtures.

8. A piece of metal weighing 200 grammes is heated to 100° C., and then placed in 450 grammes of water of 15° C. The temperature of water and metal becomes 18° C., and the water-equivalent of the apparatus is 5 grammes. What is the specific heat of the metal?

9. What will be the temperature of a mixture of 60 kilogrammes of iron of 75° C. and 10 kilogrammes of mercury of 25° C., the specific heat of iron being .11 and of mercury .033?

10. If two cannon-balls of unyielding metal weighing 200 pounds each, flying in opposite directions, with velocities of 600 feet per second, meet in the air, what will be the amount of heat developed by the concussion, and through how many degrees will the temperature of the balls be raised, the specific heat of the metal being .115?

CHEMICAL ANALYSIS (QUALITATIVE).

ANNUAL EXAMINATION.

JUNE, 1875.—*Time allowed, five hours.*

1. H_2 S is passed through different solutions with the following result: (1) Bright-yellow precipitate; (2) Dull-red precipitate at first, afterward turning to black; (3) At first, a white precipitate; finally, when saturated with H_2 S, it was black. The precipitates were obtained in an acid solution and were found to be insoluble in ammonium sulphydrate. What do the precipitates indicate?

2. Given a substance for analysis in the dry way: Metallic lustre, dull steel-gray color; easily crumbled; in closed tube melts and metallic-looking sublimate forms in globules on tube; by rubbing with a wire, these are brought together; slight residue on button, which is red-brown when hot and yellow when cold; heated on charcoal in oxidizing flame, a portion volatilizes and an incrustation is obtained, which is

orange-yellow when hot and yellow when cold; flame reaction, pale-blue. What substances are present? How would you get it into solution?

3. Given a solution of $Cu\ Cl_2$ and $Zn\ S\ O_4$, to prove the presence of both acids and bases.

4. In identifying a substance, is it necessary to obtain it in the elementary condition? Show by illustrations what is the case.

5. Write a plan upon which the acids can, with but few exceptions, be classified. Give the special tests in the cases of the exceptions.

6. Describe the two methods for the separation of the members of class III, and give the principle upon which each depends. Which would you employ in practice? Why?

7. How can the silver in a solution containing copper be completely separated from the copper? Upon what does the separation depend? What is the law which explains the formation of a precipitate in a solution?

8. Give the members of the IV. class with the class reagent. What is the composition of the precipitate? What other substances are liable to be thrown down? In separating the members of this class, why should the mixture be allowed to cool after digesting the precipitate with $H_2\ C_2\ O_4$? What inferences may be drawn from the color of the original precipitate?

9. Given a solution containing the members of the VI. and VII. classes, to separate and determine. Why do you not look for the rest of class VII. in the filtrate from the Mg. precipicate? Give the reactions taking place.

10. Define reagent, class reagent, precipitate, precipitant, supernatant liquid, filtration, filtrate, and filter.

QUALITATIVE ANALYSIS (PRACTICAL).

Each student was given one of the following substances for analysis:

Silver coin.
Brass (boiler tube).
Type metal.
Tin amalgam.
Soft solder.
Nickel coin.
India and Chili salpetre.
Alloy Zn + Pb.
Cubic saltpetre and salt.

ELECTRICITY AND MAGNETISM.

ANNUAL EXAMINATION.

JUNE, 1875.—*Time allowed, five hours.*

1. Suppose two Leyden jars in every respect alike, with their inner coatings in electrical connection, are charged negatively, the outer coatings being at the potential of the earth. If one of the jars be now insulated, and the potential of its outer coating be raised by adding a positive charge, what changes will take place?

2. Electrical potential is one factor of energy. What is the other factor? May there be electro-motive force without difference of potential?

3. What is the electrical capacity of a plate 16 centimetres in diameter and 4 centimetres from a parallel uninsulated plate? What is the quantity of electricity in absolute units on this plate if the potential is 6? What if mica be used as the dielectric?

4. What is meant by the specific inductive capacity of a dielectric? Of what importance is this in telegraphy?

5. What is the definition of unit of current in the electro-magnetic system?

6. Explain the formula $C = \frac{H K^2}{L} \tan \theta$.

7. If L, M, and T represent fundamental units of length, mass, and time, what are the derived magnetic units?

8. What is the ratio between the electro-magnetic and electro-static units of quantity, electro-motive force, and resistance ?

9. What is an expression for the couple tending to turn a magnet suspended in a magnetic field at right angles to the lines of force ? Define intensity of magnetization of a magnet.

10. What arrangement of 48 cells will produce the strongest current through a telegraph-wire of 25 ohms resistance ? The dimensions of the cells are E. M. F = 1 volt and B = 2 ohms. What will be the strength of current measured in farads per second produced by this arrangement ?

11. If a constant difference of potential of 12 volts be maintained between A and B, which are joined by three wires in multiple arcs of 4, 12, and 20 ohms resistance, respectively, what will be the total current flowing from A to B, and what proportion will flow through each wire ?

12. What is the resistance of a galvanometer if a shunt of 82 ohms resistance reduces its sensibility 100-fold ?

13. Prove the theory of the Wheatstone bridge by Kirchkoff's laws.

14. Upon what does the speed of signaling through a cable depend ?

15. Give a method for locating a fault in a telegraph-line.

16. If one electro-magnetic unit of current will decompose .00092 gramme of water, how much copper per hour should a battery of 16 cells arranged in series deposit ? The dimensions of the cells are as follows: E. M. F = 1 volt and the internal resistance 2 ohms. The external resistance is 6 ohms.

PRACTICAL EXERCISE IN THE LABORATORY.

1. Determine with this gold-leaf electroscope and a piece of sealing-wax whether this brass globe is positively or negatively electrified.

2. Fasten an arrow on this wire, which connects the plates of this Grove's battery, indicating the direction in which the current flows.

3. Hold the wire near this magnetic needle so that the marked end of the needle shall turn toward this block under the influence of the current.

4. A current flowing into this galvanometer, as indicated by the arrow, deflects the needle as the hands of a watch move. Move this coil toward this magnet so that the induced current shall produce a deflection in the same direction.

5. Work the Carré dielectrical machine, and explain its action.

6. Describe the action of the Clarke magneto-electrical machine.

7. Describe the construction and action of the Farmer dynamo-electrical machine, the key-board, and fuses.

8. Describe the astatic galvanometer.

9. Measure the internal resistance of this battery.

10. Measure the resistance of this wire by the Wheatstone-bridge method.

11. Illustrate with these coils the attraction and repulsion of parallel currents.

12. Work and describe the action of the inductorium.

SECOND CLASS.

STEAM-ENGINERY.

ANNUAL EXAMINATION.

JUNE 11, 1875.—*Time allowed, five hours.*

I. Given: length of stroke, 48 inches; initial pressure of steam, 28 pounds per square inch, per gauge; vacuum, 25 inches; cut-off, 33 inches from the commencement of the stroke. Required the mean pressure; mean unbalanced pressure; terminal pressure;

unbalanced terminal pressure and gain in per cent. of force, provided the steam is made to produce the same effect as if it followed full stroke.

II. Sketch and describe an adjustable cut-off as applied to a poppet-valve, and one as applied to a slide-valve.

III. Sketch and describe two gauges which measure pressure by the elasticity of metal, and two which measure pressure by the height of a column of mercury.

IV. In a mercurial siphon-gauge, the diameter of the long branch is $\frac{3}{8}$th of an inch; the diameter of the short branch $\frac{1}{4}$th of an inch; pressure of steam 30 pounds above the atmosphere. To what height will the mercury in the short branch rise above the zero-line?

V. Given: the diameter of a cylinder 50 inches; stroke, 4 feet; cut-off, $\frac{3}{8}$ds stroke; space in clearances, nozzles, &c., 8 per cent. of total capacity of cylinder; pressure of steam, per gauge, 35 pounds; revolutions, 65 per minute; coal consumed per hour, 5000 pounds; density of water in boiler, $\frac{2\frac{1}{2}}{32}$; density of sea-water, $\frac{1\frac{1}{4}}{32}$; temperature of feed-water, 120°. Required the number of pounds of water evaporated per pound of coal.

VI. Water in the boiler carried at a density of $\frac{1\frac{5}{8}}{32}$; temperature of condenser and water in hot-well, 110°. Compare the economic performance with that of the same engine, carrying the water in the boiler at the same density, but the temperature of the hot-well being 120°; the mean pressure of steam in both cases being 15 pounds per square inch.

VII. Sketch and explain an indicator-diagram taken from a non-condensing engine, from the following data: Stroke, 10 feet; pressure of steam, 80 pounds, per gauge; cut-off, 12 inches from the commencement of the stroke; back pressure, 2 pounds above the atmosphere. Show, in dotted lines, the effect of too much or too little lead to the steam and exhaust.

VIII. Given: the diameter of a cylinder, 33 inches; stroke, 3 feet; diameter of air-pump (double-acting) 12 inches; mean pressure from air-pump card, 5 pounds per square inch; pump filled $\frac{1}{4}$th full of sea-water at each stroke. Required the percentage of the total power of the engine to work the pump, the mean unbalanced pressure being 20 pounds.

IX. In Question VII, the diameter of the piston is 36 inches; revolutions, 18 per minute. Calculate the I. H. P.

X. Demonstrate the increased efficiency of using steam of 75 pounds pressure per square inch over that of 5 pounds pressure per square inch (both pressures being taken per gauge). Temperature of water in boiler 70°.

MACHINE-CONSTRUCTION.

ANNUAL EXAMINATION.

JUNE 12, 1875.—*Time allowed, four hours.*

1. Sketch a common three-ported slide-valve. Name the fundamental functions of the valve, and state at what edge each function is performed. Give the eccentric angular advance, and show its effect upon each function.

2. Give the same valve both steam and exhaust lap, and show the effect of each. What relation exists between the measure of the lead, the measure of the lap, and the angular advance? Prove it.

3. Give finite values to the lead, lap, and angular advance, and construct a diagram illustrating graphically Questions 1 and 2.

4. Sketch and describe the method of generating a helicoid of axial expanding pitch.

5. Sketch and describe the Clubbock governor, and the Huntoon governor. Upon what general mechanical principles do they depend for their action?

6. Sketch and describe the Giffard injector.

7. Sketch and describe the Whitworth quick-return motion.

INDEX.

AN ADDRESS

TO THE

MEMBERS OF THE GRADUATING CLASS

OF THE

UNITED STATES NAVAL ACADEMY,

ANNAPOLIS, JUNE 20, 1876,

DELIVERED AT THE REQUEST OF THE OFFICIAL BOARD OF VISITORS,

BY

DANIEL C. GILMAN,

PRESIDENT OF THE JOHNS HOPKINS UNIVERSITY, BALTIMORE, AND MEMBER OF THE BOARD OF VISITORS TO THE ACADEMY FOR 1876.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1876.

ADDRESS.

YOUNG GENTLEMEN OF THE GRADUATING CLASS:

Soldiers and sailors are not fond of long speeches. With them it is a word and a blow: deeds, not essays, are the language they prefer. "I came, I saw, I conquered;" "England expects every man to do his duty;" "Forward and fight;" by such pithy sayings, they make reports and give commands.

So before this nautical assembly my words must be brief; but you will, I am sure, grant me some grace because of the triple message which I bring.

First, as a member of this board of visitors, and by their request, I tender to you all, from the chief in command to the youngest cadet, our praise and thanks. Be assured that these observers from New York and California, from Georgia and Minnesota, are alike impressed with the nautical skill, the mental power, and the honorable character developed here.

Intelligent citizens in every part of the land are familiar with the history, methods, and results of this Academy. They believe in it; they hope in it; they glory in it. They welcome to the public service each new band of graduates—glad and proud that the officers of the Army and Navy are so well trained at Annapolis and West Point, that neither the flag nor the finances of the country will suffer in the hands of such guardians; and hoping that the civil service will never be inferior.

As the official visitors of this year, we have seen more than most of our fellow-citizens can ever see of the methods by which such results are secured, and we add our testimony to that of others in praise of the scholarship, the seamanship, and the manliness, moral and physical, which are here promoted. In years of danger, these graduates will

be our defense; in years of peace, our representatives throughout the globe.

Again, as a college officer, let me express the recognition which is paid by men of science, near and far, to the professors and graduates of the Naval Academy, and let me assure you of the fraternal spirit which is cherished for all who are here trained. Naval officers sometimes feel that their careers, particularly in peace, are unobserved and uncared for. Their duties call them to distant ports, where they see but seldom their countrymen; but let me assure you that they are not forgotten. Their contributions to science, their influence upon the advancement of civilization, their representative character, are never overlooked by educated men.

Sometimes, too, the colleges have a reciprocal action on the Navy. As I recall what this Academy has done for science, you will gladly remember, I am sure, that it was a graduate of Columbia, Alexander Hamilton, who first suggested the Naval School; a graduate of Harvard, George Bancroft, who decreed its existence by a ministerial act which showed true statesmanship; a graduate of Yale, William Chauvenet, who shaped its scientific courses; and a graduate of Dartmouth, James W. Grimes, whose influence secured its restoration to this place, when counter influences would fasten it upon a distant shore.

Once more, I salute you in behalf of this galaxy of mothers, sisters, friends—those bright particular stars—who will watch your course unceasingly like the constellations of the heavens. We hear it said that chivalry went out of modern society when gunpowder came in; but it is not so. With the helmet and the coat of mail, the tournament and the duel are gone, let us hope, forever; but the essentials of chivalry—loyalty, fidelity, and courtesy, the defense of the weak, bravery before danger, the homage of the pure and gentle, and the maintenance of personal honor—these principles still rule in our service. These fair faces, watching your naval jousts, as the tournaments were watched of old, rejoice as you win the sword and epaulets, and bid you be true chevaliers, more knightly, because more enlightened, than those whose exploits are recorded by the ancient chroniclers. They give you the greetings which belong to knights on the eve of battle and in the hour of victory, "Be faithful, bold, and fortunate."

Here my message is closed and my speech might be concluded, but other thoughts ask utterance amid all the associations of this place before we part.

I shall not, though the centennial year suggests it, attempt to review the naval history of this country. Were I to name all the heroes from Paul Jones to Du Pont and Farragut, and all the cruises from that of the Alfred to that of the Fanklin, the list would exceed the famous catalogue of ships and captains which Homer has handed down to us. Brave achievements and brave men are not forgotten by the young in the romantic period of their lives. A very slight inspection of yonder library shows the well-worn pages of naval biography.

But I cannot forget that you begin your careers, young men, in the time of peace; our last danger of collision with a naval power having been averted by the principle of arbitration successfully maintained by a President whose fame was won in war.

Now, peace as well as war breeds heroes. You need only glance at the monuments on these walls to observe that danger is always hovering near the sailor. Were these tablets chosen for the purpose, they could not be more typical:—there, the fierceness of the elements is commemorated; there, the treachery of the savage; there, the pirate's deadly blow; and on them all the bravery of those who were lately here. I confess that the heroism (recorded on yonder slab) of Talbot and his party who for fifteen hundred miles were in combat with the elements that they might bring relief to their comrades, and who died as they reached the shore, seems to me as worthy of epitaph and song as any battle action. The surgeon, the captain, or the chaplain, who faces grim pestilence and contagion for weeks and months, that he may relieve his ship-mates, is as worthy of tribute as he who directs the guns and wins the battle.

> "Cowards die many times before their deaths,
> The valiant never taste of death but once."

But the battle is not always with the elements, nor with the enemy, nor with disease. There are daily foes to be met, more treacherous, more deadly, more persistent. The chief of these is idleness, which brings in its train a host of imps. It is easily routed by a love of knowledge. I know very well that life at sea is full of interruptions, as it is of danger, but science and literature abound in illustrations of victories against such obstacles; and the service is now so ordered, with its repeated and careful examinations, that the officer does not fulfill his round of duties unless he prosecutes in some form or other the studies here begun.

It is a satisfaction to hear from those who are in positions of rank and authority in the Navy Department that there is always a de-

mand for specialists; so that no young officer who feels a special drawing toward some branch of the service need fear that his talents and attainments will be overlooked. There are, as it were, graduate places open to those who have left this institution, in the Torpedo School, the Hydrographic Office, the Academy instructorships, the Observatory, the Nautical Almanac office, in all which positions the training of a cadet may be carried forward to higher perfection.

If we look for the earliest entrance of the American Navy upon a foreign sea, we shall discover that a hundred years ago a brig of sixteen guns, named the Reprisal, set sail from Delaware Bay for a port in France. It carried, as a passenger, a gentleman of seventy years of age, said, by a French contemporary historian, to join "the spirit of Socrates to the demeanor of Phocian," and with him were two grandsons, seven and seventeen years of age, doubtless the earliest cadets of the Navy. Delayed by contrary winds, chased by the British cruisers, capturing two prizes, the ship completed her voyage in somewhat more than a month,—not a day of which was passed by the venerable passenger without some scientific observations, in the face of all the untimely interruptions. This philosopher was Benjamin Franklin; and his researches respecting the temperature of the ocean laid the foundation of our exact notions of the Gulf Stream, and of the modern investigations by which the Tuscarora and the Challenger are throwing light on the distribution of marine life. So, my friends, our Navy in its first transatlantic voyage was the ally of science; so it is now; so may it ever be. Fitly is the name of Benjamin Franklin borne on the flag-ship of our European squadron, commanded by the Admiral under whose superintendence this graduating class began their studies here.

We cannot rejoice too much in the union of navigation and science thus auspiciously inaugurated in the earliest oceanic voyage of our Navy, nor be too familiar with the obligations which we owe to a century of officers, not only for what they have won and defended by their bravery, but for what they have by their science observed, recorded, interpreted, and promoted.

Consider for a moment the peaceful scope of the naval service.

For example, we approach the Atlantic seaboard in fog or storm, sure of our nearness to the land by observations of the Gulf Stream, which Franklin instituted, and which his descendant, the head of the Coast Survey, has elaborated and reduced to scientific laws; then we praise the Coast Survey as a branch of the civil service, and we praise it rightly; but we remember that scores of naval officers have been

attached to its staff. We speak of the Astronomical Observatory at Washington as a national foundation, and so it is; but the astronomers who use that majestic lens, and interpret to us its accurate revelations, are professors in the Navy, under the superintendence of an admiral, distinguished alike in peace and war. We cross the broad Pacific, guided by the stars in their courses, grateful for the ephemeris which is calculated by an officer of the Navy. When we send a message by cable to our antipodes, we owe our thanks to the young lieutenant whose ingenious invention made the deep-sea soundings so trustworthy; and his cotemporary in the service, who surveyed the submarine plateau from Newfoundland to Ireland. As we ascend the Chesapeake by night, guided by the colored lights which crown the headlands with a coronet of emeralds and rubies, we are conscious of our obligations to the Light-House Board, of which the naval officers are such efficient members. We study the chief handbook of American geology, and it reminds us that its author, Dana, was a professor of mathematics in the Navy, and was the companion of Wilkes in his voyage around the globe more than thirty years ago, as ten years previous Darwin had been the scientific companion of Fitz Roy in the Beagle. We admire the bronzes and the lacquered ware which Japan sends to the Centennial; we see her influences reflected in European art, and in our own domestic decorations, and we involuntarily think of the naval expedition by whose wise conciliation the island empire of the sun was opened to the West.

Recall the chieftains in these and kindred enterprises.

Now it is Wilkes, leading an exploring expedition around the globe, and adding to the science of the world the researches of Dana and his colleagues; now it is Porter, representing his country as their minister resident in Constantinople; now it is Perry, carrying the good-will of America to the distant island of Japan; now it is Maury, studying the log-books of every ship and sea, that he may deduce the laws of winds and currents; now it is a young lieutenant, De Haven, seeking to relieve the Franklin party in the Arctic seas, or the young surgeon Kane, carrying the flag to the remotest seas of the North; now it is Foote, suppressing the slave-trade upon the coast of Africa; now it is Lynch, exploring the Dead Sea and the Jordan, now Brooke, devising an apparatus for deep-sea sounding not yet superseded; now it is Berryman, discovering the telegraphic plateau; now it is Herndon and Page, opening the rivers of South America, now Selfridge, Schufeldt, and Lull, surveying the routes of an interoceanic canal; now it is Hubbard, watching the stars by

night and visiting the hospital by day, till his life is exhausted by this double strain; now it is Belknap, sending his piano-wires to the bottom of the Pacific, discovering the submarine peaks and plains, and mapping lands never seen by mortal eye—a veritable Columbus of the deepest sea-soundings; now it is a corps of engineers, studying the laws of heat and steam; now an ordnance corps, measuring the force and velocity of projectiles; now a chronometric party in the West Indies; and now a staff of astronomers, ranking with the greatest men of their times, observing in Washington the movements of the stars, or traversing sea and land for observations of an eclipse or transit.

Young Gentlemen of the Graduating Class: In such a noble lineage as the American Navy you are now enrolled. It was not your birth-right, nor have you won your rank by favoritism or purchase. Talent introduced you; obedience and industry promoted you. The severe discipline to which as cadets you have been subjected is intended to secure "the survival of the fittest;" so that we may indeed congratulate the chosen few who have completed this course.

Now comes the voyage and the battle: "Acquit you like men; be strong." Remember wherever you go that the Navy blue represents the United States of America. You will carry the flag to the most distant sea-ports; you will wear your swords among the brave and cultivated of every nation; you will bear the torch of science to regions unexplored; you will maintain our escutcheon firm and bright in every quarter of the globe; but be mindful always that the Navy, more than any other organized corps, exhibits to the world the manners, the morals, the learning, the wisdom, and the courage of this country. You assume great responsibility; but, like those who have gone before you, you will bear it well.

> "No man here,
> O Thoas, seems blameworthy; for they all
> Are skilled in war; nor does unmanly fear
> Hold any back; nor from the difficult strife
> Doth sloth detain one warrior."

You leave your homes to form a home on ship-board, there, as you rise in command, to oversee the health, the occupations, and the welfare of large bodies of men; you leave your native land to carry its arms and its insignia to other shores, that every wanderer, the merchant or the missionary, the sailor or the traveler, when he sees the flag, may feel protected beneath its folds, his heart beating quick,

and his eye moistening, when he thinks of the home and the Union its colors represent.

As I began with a triple message, I would offer you, in conclusion, a triple garland. Here are laurels from the board of visitors, representing for a moment the citizens of this land. Here are olive leaves, sacred to Minerva, the symbols of learning and industry; accept them as the tokens of fraternity from other colleges and seats of learning. And here, most precious of all, are the ivy leaves of friendship, interspersed with the forget-me-not of affection, which these officers, these relations, and these friends—fair women and brave men—have woven for you. With these triple wreaths begin your voyages, and the blessings of Heaven attend you. FAREWELL.

FELLOW-MEMBERS.

A

FAREWELL SERMON

BY

REV. GEORGE W. SMITH, A. M.,

CHAPLAIN, U. S. NAVY.

Preached in the Chapel of the United States Naval Academy, Annapolis, Md., September 24th, 1876.

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TO THE

CADETS OF THE U. S. NAVAL ACADEMY.

My Dear Young Friends :—

An experience of many years in the Christian Ministry (as you, whose years are so few compared with mine, must reckon years) has taught me that to disregard the counsel of men of experience, in any department of life, although that counsel may not coincide with my own views, is to show folly and not wisdom. Therefore, when some friends of ours, of you and me, who have the welfare of the United States Naval Academy especially at heart—as God knows I have—suggested that my sermon of last Sunday morning be printed, as a memento of my brief stay among you, and as "calculated to do ome good," I acquiesced.

Perhaps I may have been led to this conclusion by my strong desire to make some acknowledgment of your kindly attention during the very pleasant Practice Cruise of last summer. Anyway, your general propriety of conduct, and kindly indulgence of that anomaly, a chaplain, on board ship, deserves record. And so I have written out my remarks of last Sunday, as near as I can recall them ; and if they shall be of any service to you, my labor will be amply repaid.

On the whole, I think my remarks true. Make what deduction you choose, and hold on to the rest. If you can retain in your minds what was said about our fellow-membership in our Divine Master, my work among you will be accomplished.

Your friend and servant,

GEO. WILLIAMSON SMITH.

U. S. Naval Academy,
Annapolis, Md.
September 25th, 1876.

SERMON.

Ephesians, iv, 25: *We are Members One of Another.*

Such is the consideration presented by the apostle for the practice of truth among Christians: "Putting away lying, speak every man truth to his neighbor; for we are members one of another."

Your attention is asked for a few minutes this morning to the consideration of this text as it bears upon us here, where circumstances render its truth strikingly apparent and its application direct and pointed.

First, however, I would deprecate any feeling of resentment that may arise in the mind. It is evident that if a preacher addresses his hearers in such a manner as to fail of their good will, he not only misses his aim, but he injures his cause. Direct speaking from the pulpit has always to run the hazard of offending those who are called upon to listen, because religion deals with the most intimate concerns of men; and pertinent texts act like a surgeon's knife, to lay bare the secrets of the individual soul. For it is written that the word of God is searching, "and powerful, and sharper than any two-edged sword, piercing even to the dividing asunder of soul and spirit, and of the joints and marrow, and is a discerner of the thoughts and intents of the heart." (Heb. iv., 12.)

And yet, brethren, how is God's word to accomplish its work among us? Are we to overhaul the bones of dead people in whom we have no interest, and paste our texts on them? or are we to apply the Divine word closely, and without shrinking, to ourselves in our own day, and with reference to our own circumstances? I fear that very little improvement would come from condemning sins that there is no possibility of our committing and resisting temptations by which we are never assailed. In other matters you have no doubt as to the method of procedure. Your professional studies are not directed to the Greek trireme and Roman galley, but they go straight to the steam frigate and iron-clad—to the actual present and its needs. So, I believe, that the power of God's word is to be found in the manner in which it applies to the actual present, and works in these circumstances wherein God's providence has placed us. This be my apology for venturing, perhaps rashly, to "use great plainness of speech" on a matter of vital importance to you and this school.

Our text brings clearly before us the fact that our personal and professional interests are very closely united. When people are brought together, as we are here, it is important that they recognize their relations to each other; especially whether they are really brought together as friends or enemies; whether they have one common object in view, or aim at things contrary to each other. If their object is the same, their interests are, so far, identical. If the object be a most important one, as it is here, then it should bend all individual inclinations, however diverse, in one direction. For "we are," through that interest, "members one of another." Now, if one who is aiming to become, or to prove himself, a good Naval Officer, should lead another to set at nought the laws of the service, would he not act somewhat like a soldier who should weaken the army by poniarding his fellow soldier?

"We are members one of another." My young friends, Cadets at the Naval Academy, the Officers and Instructors who keep watch over your actions, and report misconduct, and give low marks for poor recitations, are members of yourselves. They are your hands, to do what you otherwise are not yet able to do; your feet, to walk in ways that you are not familiar with; eyes, to see what else you would not see; and ears, to hear what you otherwise would not hear. Their "glory and crown of rejoicing," their reputation among men, their satisfaction in their own hearts, their approval before the Great White Throne, depend upon what the graduates of this school are found to be. They have here no interest at variance with yours; you have no interest different from theirs. You wish to be honorable men and accomplished officers; they wish you to be honorable men and accomplished officers. You are "members one of another."

How is your object to be attained, your end to be reached? Can it be done by separating into hostile bands? Is it not indispensable to remember that you "are members one of another"? Surely this point need not be pressed further. Indeed, brethren, I would be ashamed to urge such considerations as these, were it not that they serve to introduce another aspect of our text.

This place, and the occasion of our assembling, bring before us a wider and deeper relationship, in which are placed the foundations of the excellence to which you aspire in professional matters. Beyond the matter of interest, to which I have adverted, there is involved what is termed "moral principle." Our membership one of another reaches farther than the superficial striking of hands for attainments in seamanship and gunnery, and for improvement in the organization of a man-of-war. It will fail to accomplish even these objects, unless there be the spirit and tone of virile morality in the daily intercourse of those who are most intimately and constantly associated. A school, as you know, takes standing according to the character of its members, and when we speak of character, we mean not merely the attainments in scholarship, but the moral state and condition of a man. As "members one of another," there is a mutual

influence, there is a subtle pressure of mind on mind, very real, though not sensible, which is constantly moving individuals and masses of people from one position to another. There is what is called "public opinion" which determines the standard of right and wrong in a body; and it not only determines actions, but, as we shall see by and by, in some degree moulds the thoughts.

The discipline of this school may bring about a certain proficiency in the technicalities of your profession. If necessary, this can be accomplished by the excision of those who are recalcitrant, and refuse to obey its regulations. This is always a painful thing; because it is well nigh a mortal hurt to the offender, and it carries grief and dismay into so many households, causing tears to fall and hearts to bleed with agony. Its avoidance is very often in your power;—in the power of the associates, the companions, the friends, the fellow-cadets of one, who, either through self-will or misfortune, is in danger ot becoming desperate and of blindly braving the extreme stretch of authority. Cheerful and ready observance of the requirements of your position, which takes away the burdensomeness of daily routine duty depends very largely upon the spirit and moral tone that obtain among yourselves. If your staple conversation is "what a hard time you have," and criticism of what is done by those over you, and pleasant-picture painting of things of which you are ignorant, you add immeasurably to your work. By this means you will cease to believe in your own profession; and if you cease to believe in its excellence, you lose your fitness for it. But if you have it understood among yourselves that the thing commanded is the thing to be done, then the effort required to do it is immeasurably reduced.

If you agree among yourselves that things equally wrong morally, or by regulation, shall be divided into two classes, and those in one class shall have your sanction and the other not, it will be so, until the inevitable catastrophe comes, when you will be forced to own in your heart that your distinction was artificial and unwarranted—that these you ought to have done and not to leave the other undone.—If you scorn the falsehood which seeks to evade the penalty of wrong doing, you set up a standard of truth to which all, in their hearts, will pay homage. The consequence will be manly acknowledgment of faults and a cheerful submission to the righteous consequences; and this will elevate the character of the offender and prevent a repetition of the offence. But if you do not condemn, if you do not frown upon the wilful violation of the laws which you are sworn to uphold, you set up a standard of falsehood instead of trust, and teach each other to take refuge in lies.

That public opinion among the members of a school has power, in some degree, over the thoughts of those in it, may appear from this fact: the prevailing sentiment will change from year to year. One year there will be scarcely an instance of some particular offence, because it is considered dishonest or mean by the pupils, and they will have no fellowship with one who is guilty of it. Then one who com-

mits that offence feels degraded; he is no longer the peer of his companions. Another year there will be repeated instances of the offence; not because the rules have been changed or the discipline relaxed, but because it is no longer condemned by the public voice; and one may do that thing without the sense of having stepped down, or been thrust down below the grade of his fellows.

Permit me, my young brethren, thus to bring before you the power that is in your own hands for the prevention or correction of the evils by which you are liable to be assailed in this place; let me also add, a power for advancing your best interest, if it be rightly applied. Would it be right to think in your hearts that, in some respects, the tone of the School is not satisfactory, and that some change ought to be made in the administration of its affairs to improve it, and all the while this or that wrong thing is done—not because it would not be punished if discovered, not because those in charge are faithless or indifferent, but because there is not the moral stamina among you to say out loud, that prevarication is falsehood; that "weathering" is lying; that "gouging" is cheating and robbery (for by it, one aims to occupy a place that he is not entitled to, and robs another and better man than himself of his number, and so works to keep him his whole life below where he belongs—yes, successful "gouging" is a life-long robbery of one's neighbor;)—that appropriating other people's property under the name or pretence of a "lark," is stealing; that swearing is a sin against God and man here, as it is everywhere else, but has also a particular quality of added grossness, because it is expressly forbidden in the particular laws which govern us here, and of which we are the sworn upholders; that———

But I forbear, lest I suggest sins familiar enough elsewhere, but of which you have never heard. Indeed, it is pleasanter and more profitable to bring before you your power and consequent responsibility, as members one of another, in those things which are "laudable, glorious, and honorable" in the noble life that you are entered upon. The virtues and excellencies characteristic of your profession are known and praised of all. That their root must be found here, goes without saying. Hence the conviction throughout this great nation that sons may be left here with full assurance that a high moral tone is maintained; that their daily associations will be with those who are above things mean and paltry; who are proud of their manhood, aiming to be worthy successors of those whose names are illustrious in their country's annals, and synonyms for integrity and honor.

If there be frankness and ingenuousness in the Naval Service, if the conviction be universal throughout forty millions of people, that no one of you would take "from a thread to a shoe latchet," that public interests may be securely intrusted to the keeping of the youngest among you to be administered honestly according to the ability that God has given; if it is felt that man may safely put life, property, and honor in your hands, this is due, not more to the fact that they

who are over you in the Lord seek to inculcate sentiments of honor than to the fact that you adopt and zealously foster those sentiments among yourselves. Thereby you have rendered it morally impossible for one of you to violate a public trust, by taking away the possibility of temptation to violate it.

To conclude on this point. Because you are members one of another, you can impart the moral strength of a hundred to the weakest among you. Each one is his brother's keeper. Each one acts upon others and is acted upon in turn. Therefore every righteous act, every act of integrity, every word of truth, every fearless avowal of high principle, every condemnation of falsehood, cowardice, or wrong in any form, is a contribution to the maintenance of a good, healthy, moral tone in the whole body.

And this power, brethren, I would enlist for the furtherance of the Gospel. "We are members one of another" for the eternal purposes of God. It follows from what has been said, that it depends upon you whether piety and religion shall be honored or shamed in this place. You can make the cross of Christ a derision, or the cherished symbol of salvation. While the power for the maintenance of religion and advancement of the Gospel is lodged in the hearts of people; while there is no enginery of compulsion, no external force that can keep alive and render effective the truth of God, of which the fruit is righteous living, there is a power of association that avails much to advance or retard the work of Christ in the individual man.

At times we are quick to apprehend and appreciate that which is "lovely, true, and of good report," because of the vibration of some tender chord touched by affection's unconscious finger. We can not feel that we are committed to the training of this School, with many earnest prayers that we may grow up honored and honorable in the sight of God and man, without being sobered into seriousness, and a spontaneous uprising in the heart that those prayers may be answered. Will you further this heaven-implanted desire? I have confessed your power. I bow to it for the sake of Him in whose name I am permitted to speak.

You know, and I know, that you are aware that a person is peculiarly sensitive to the influence of others in things of religion. You have found out, at your age, that if there is any one thing which requires our constant care to keep it from decay, it is personal religion. St John, in his first epistle, points to the "fellowship" of Christians "one with another," as their strength. And what is the Holy Communion, the Sacrament, instituted by our Lord on the night of His betrayal, as the substitute of His visible Presence, which had heretofore bound them to each other through Himself, but a means of spiritual strength through intercommunion one with another by the mutual partaking of His Body and Blood? I do not propose to offer you "the length and breadth, and depth and height" of this Holy mystery; but it is evident that it is connected with His high-priestly prayer that

"all may be one," that Christians may know and feel that they do not stand alone, but are "members one of another."

There is strong need, in this matter of religion above all things else, of standing together; of strengthening each other; of upholding each other's hands; of acting out and speaking out the conviction of the heart, that we may mutually give and receive aid.

On this matter, as your servant in Christ, I speak with confidence; knowing that these poor words will find approval in the homes where you are loved, from every fond maternal heart, from those here who have your welfare for a care, from *yourselves*—all in united chorus will echo the Apostle's words: "We are members one of another, we are members one of another" in Christ, for time and for eternity.

Suffer me one word more. It is probable that this is the last time that I shall have the privilege of addressing you. After a service of some years in the Navy, I am called to another field of labor. Yet my work is always the same, whether here or there, there is but one word to say—a word applicable to all living. It did not seem to me well, under these circumstances, to end my present service in the Navy, where I have had so many pleasant associations, and of which I shall always retain such tender memories; where I have been so courteously entreated, and to the officers of which I owe so much gratitude—I do not particularize them, for God knows I have them in my heart, and I thank Him that you have the chief of them charged with your welfare—without giving you the very true convictions that have grown of this service.

If I have spoken plainly, rudely, offensively, pardon me, I pray you, for the sake of Him in whose name I am permitted to speak. If anything has been said that is true and profitable, heed it for His sake. The rudeness, the lack of tact, the probably just cause of offence lay to *my* charge. Keep the good, and let me go forth bearing the reproach of the human that is evil. I will bless Him for the reproach, coupled, as it is, with the great privilege that I have enjoyed.

Finally, let me pray that His richest blessings may rest upon you and those whom He has set over you. May He bless you here in your work and in your recreation. May He bless you in the service of your country during your lives, and be with you at the hour of death. And though we never more meet here on earth, may it be ours to hear, when we finally meet before the judgment seat, the blissful words: "Well done, good and faithful servant; thou hast been faithful over a few things, I will make thee ruler over many things: enter thou into the joy of thy Lord."